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Prepare for Winter

The season for active maintenance work on the more northerly roads is now practically at an end. While in many instances work will be continued unabated as late in the fall as possible in order to overcome the deficiencies of the earlier months, and to get the maximum amount of improvement work completed, this procedure can be carried on only at the risk of being closed down abruptly. It is therefore important that all maintenance operations be so conducted that they can be closed down when the necessity arises without loss. At this season of the year it is also important that each section foreman make all preparations for winter. If in heaving territory, he should have an adequate supply of shims on hand. He should open his track at switches to facilitate drainage and adopt such other precautions as past experience has shown to be advisable. The first cold wave or hard storm will be held in less dread by the man who is prepared than by the one who is not.

Place Your Order for an Index

With the gradual exhaustion of our natural resources, the improvident practices of pioneer days must give way to those of prudent economy. The late war exerted an enormous influence in bringing the American people to a realization of this truth. This is more emphatically the case with the products of forest than those of mine, field or quarry. Lumber, wood pulp and paper cannot be wasted as they were in the past. The publishing of periodical indexes suggests one opportunity for the exercise of a wholesome conservation. Indexes are of great importance to libraries and to individuals who preserve magazines for reference or binding. They are of little value to the subscriber who does not preserve his magazine file, no matter how carefully he reads each current issue. As past experience has shown that not all subscribers bind or otherwise preserve their copies, the *Railway Maintenance Engineer* will print only a sufficient number of copies of the 1920 index to meet the demands of its subscribers. For those who have a real need for it, copies of this index will be furnished on request.

The Associations and the Roads

The Bridge and Building convention which was held in Atlanta, Ga., on October 26-28, the proceedings of which are abstracted elsewhere in this issue, was most successful. The same result characterized the recent annual meeting of the Roadmasters' Association in St. Louis. No one influence is contributing more to this condition than the encouragement which most of the railway managements are extending to these organizations. On nearly all roads permission is granted those desiring to attend these meetings. On many roads, the officers are urged to go to the meetings of their respective associations. Support of this character should be universal for one cannot sit through one of these meetings without realizing the great practical benefit to these men which comes from the free exchange of opinions and experiences relative to their every-day problems. The railways are facing the most

urgent demand for efficiency in all of their operations which has ever confronted them. These associations can contribute much to this need. Each occupies a place which no other organization can fill and is therefore deserving of the support of railway managements, not primarily for the help which will accrue to the association, but because of the greater service which this support will enable these organizations to render to the roads.

The Supervisor's Responsibility for Morale

No problem is of more concern to the railways at the present time than the restoration of the proper morale among their employees. In common with other branches of railway service and with other industries, the maintenance of way department has experienced a marked letting down of that spirit of loyalty to employer within the last two or three years, a change all the more marked here because of the long record of fidelity to the roads in the past. Regardless of the causes for this situation, it must be corrected and evidences already indicate that some progress is being made in this direction. The solution of this problem rests with the supervisory officers and particularly with those of the rank of roadmaster and supervisor of bridges, for it is these men who come in direct contact with the foremen and the men in their gangs. In no other channel can the supervisor serve his road to better advantage than here. If he gives the proper attention to the welfare of his men, acts fairly with them as well as towards the company, and shows an interest in them, he will have done much to increase the efficiency of his forces and to promote the interests of his employer. He is in many instances the only officer who comes in contact with these men and he therefore represents the company to them. The men will in large measure reflect his attitude towards the company. If he is thoroughly loyal, they will be likewise, while, on the other hand, disgruntled, dissatisfied employees usually indicate the same spirit on the part of their supervisory officer.

Bridge Maintenance in a Transition

It has well been said that the railroads of the United States have completed the pioneer period in their history and are now in the midst of transition to an established or more permanent form. A good idea of the character of this permanent form is to be obtained from a study of European roads. Thus in his talk at the opening session of the Roadmasters' convention, Colonel F. G. Jonah stated that there was not a single wooden bridge on even the most obscure branch line in France. This is indeed a contrast with the railroads of the United States, as every American railroad man is well aware. A recent study of three typical trunk lines extending west from Chicago showed that the proportion of permanent (i. e., non-wooden) structures averages only 35 per cent, but even this figure represents a well advanced stage in permanent building when compared with roads with only 5 and 6 per cent of permanent bridges. The only object in giving these figures is to indicate the enormous task still ahead of American bridge engineers and their subordinates. One of the three middle western roads referred to contemplates a program which will require 10 years for the elimination of temporary structures on its main line alone. While this change in the character of railway bridges is taking place, a transition will also occur with respect to bridge maintenance. The work of the bridge carpenter will gradually be restricted to the timber decks of such steel bridges as are not provided with ballasted decks, the driving of foundation or fender piles, etc. On the other hand, there will be plenty to do in the care and repair of the metal bridges and the older masonry structures, for the growing perfection of concrete construction will eventually make the concrete bridge truly permanent. This transition in the nature of bridge maintenance work will be slow but it is no less certain.

The K. C. S. Maintenance Organization

The organization recently formed among the employees of the maintenance of way department of the Kansas City Southern contains a number of interesting features. Although all employees in this department of the rank of foreman and higher are eligible for membership, this membership is granted only on receipt of an application from the man himself. The system is divided into two sections and the members of each section meet at a central location on a fixed date each month to discuss their work. The discussions are in the hands of the men and they are urged to take an active part in the meetings. In this way they are encouraged to express their opinions on maintenance practices and to exchange experiences freely, with the resulting mutual advantage of the men and the company by which they are employed. This organization, in which membership is voluntary, should do much to develop interest in their work, should promote more efficient practices, and should engender a spirit of loyalty.

Do Well What You Undertake

No one thing is more essential to success in the conduct of maintenance of way work than the practice of doing well whatever is undertaken, even at the necessity of curtailing the number of operations. This applies equally to the superior officer and to the foreman. The division or the section on which patch work is the practice seldom shows any improvement, even though those on it may be working most strenuously. On the other hand, that territory on which work is done well on a limited area is soon brought entirely to the higher level of the individual portions first attacked. The wear on railway tracks and structures is so incessant that a foreman can busy himself continuously overcoming the small defects as they develop without making any marked improvement at any point. However, if he devotes as much time as possible to the heavier and more permanent repair of a certain portion of the territory he will find that, when it is completed, attention can be concentrated on the remaining portions with a great saving in labor and a marked elimination of lost motion. A few roads now plan their work so that the track on a certain portion of each section is overhauled thoroughly each year, and on the following year attention is concentrated at another point, while only the minimum work is done on that first brought up to standard. This practice should become universal, for it will enable a road to attain a higher standard of maintenance without additional cost.

THE PAST, PRESENT AND FUTURE

IT IS difficult for the average railway officer to realize that the common labor of today has changed fundamentally; that this labor has moved up to a higher plane and that it will never knowingly or willingly return to the old. Yet this fact must be recognized. In the prewar days, the market was frequently flooded with unskilled labor, men unskilled in every sense of the word

and true examples of the expression, "a strong back and a weak mind." They were chiefly immigrants from countries where the scale of living had been of the lowest. Their only needs were covered by clothes, shelter and food, all in as primitive a form as the men themselves. With such a condition, naturally a non-competitive market would only produce a price for labor barely enough to keep them from privation. As time progressed, however, these men's knowledge broadened as a result of their migrations from place to place. At the same time wages in the industries advanced, partly from the increased demand for men and partly because the men themselves had advanced. This was reflected in the railway field. Better living conditions followed. With the advent of the war, the industries made a strong bid for labor and secured it and higher wages and still better living conditions were given them as the inducement. In return they were called upon in many instances to do work generally thought to be above their capabilities. Those that could not meet this demand gravitated back to the railroads, only to weaken those forces and reduce their efficiency. The attractive prices offered by the industries also had the effect of attracting a better class of native labor. These men, both native and foreign born, responded to the surroundings under which they worked. The outcome of this development has been that we now have a new class of labor and one that will remain in the majority for some years to come. Today these men cannot be listed fairly as "common" labor. That expression is a misnomer, for in reality they are semi-skilled and in the main they are conscious of that fact themselves. This is clearly illustrated by the experiences of the maintenance of way departments of those railroads more directly in competition with the industries. The boomer, the floater, the low class laborer have all moved and their places have been filled by the man released from employment by the present more or less temporary shutdown of the factories. The efficiency of the track forces has, as a result, fairly jumped back to normal in many localities and the roads are once more able to pick and choose. It must, however, be emphasized that this return to efficiency and the increased supply of labor available should not be confused or mistaken for a tendency to return to pre-war conditions. It is true to a degree that the scarcity of work has influenced the efficiency of the men, but an equal or even more important factor to remember is that railway work is now being performed by a higher and more capable class of men. The all-important question now is how to hold these men when industrial conditions are better and the demand once more begins to equal the supply. Only a constructive policy will solve this problem and it must be one that recognizes that the labor which the railways want is no longer common labor, but semi-skilled. Future work will be largely mechanical work and in labor measures the old order must give way to the new.

> There is one way and one way only in which the railroads of the United States can be made adequate to the task that confronts them and that is through the establishment of a morale that will make every man in railroad service give of the best that is in him, not because of a hope for increased returns to himself, but for the sake of the reputation of his fellow railroad men and the property upon which he is employed. His thoughts must not be of shorter hours, but of his part, small though it may be as compared with the problem as a whole, in moving the commerce of a nation. "A railroad can only prosper as does its employees, and the employees can only prosper as does the road itself." Mutual understanding that both management and employees are striving for the same objective, mutual prosperity, is the first essential to the creation of a spirit of morale.—*From an address by William S. Wollner before the New York Railroad Club.*

THE MAINTENANCE OFFICER AND THE LABOR SITUATION

THE LABOR situation continues to improve. The shortage of men has disappeared at nearly all points. In most localities an actual surplus now exists. This change is making it possible to weed out the less efficient. It is also causing the men to speed up to hold their places. This condition will undoubtedly continue at least throughout the winter.

With the pressure which has prevailed during the last three or four years thus relieved, it is to be hoped that the railways will take advantage of the opportunity thus afforded to so modernize their methods of handling labor as to make maintenance work more attractive to men and enable the roads to compete more successfully with the industries in times of inadequate supply. While the solution of this problem will involve somewhat radical departures from the present practices on many roads for which the approval of the managements will be required, the initiative must come from those officers in the maintenance of way department most closely in touch with the conditions. Until these officers—supervisors, division engineers, engineers maintenance of way—determine what measures are practical and desirable and the means of making them effective, they cannot expect their superior officers, with the many other problems pressing on their attention, to give much study to this subject. The present unfavorable conditions of employment on many roads are due more directly to inertia on the part of maintenance officers than to opposition to improvement by the managements. No one subject offers greater possibilities for the reduction of cost than this, and the live maintenance officer should neglect no opportunity to study this problem with the purpose of devising measures which will make employment on his road desirable in times of labor shortage as well as of adequate supply.

Many improvements which can be introduced are of such minor expense that they can be effected without authority, while approval will be forthcoming on most roads for those changes of more importance and those involving questions of policy or affecting other departments whenever the maintenance officers present the proper evidence of the economy of such practices. The first and the most important step for the maintenance officer is the realization on his part that conditions should and can be improved. Once he becomes alive to the needs and the opportunities in this direction, the greatest step will have been taken in the installation of modern methods in handling maintenance of way labor.

LETTERS TO THE EDITOR

RESTORE THE INCENTIVE

Lynchburg, Va.

TO THE EDITOR:

I have read the series of articles on efficiency, published in recent issues, with much interest, but none of them has fully explained the slowing down of service. Cause and effect usually go together and there must be a reason for a lack of results in railroad work. If we did better work when wages were small, what is the argument for higher pay? I have previously favored good wages as an inducement for better service.

All normal, right-thinking men have a desire to improve their conditions and so long as ability and loyalty measures the size of his pay envelope a man is inspired to do better work. Ambition and energy increase his skill for the hope of reward. More pay without the spirit of rivalry to develop ability does no good so far as efficiency goes and has proved to be destructive to railroad organizations. Federal management increased salaries without any reference to ability or experience and reduced efficiency to a low level by equalizing the pay without equalizing the standard of skill and experience.

Federal control squeezed out the spirit of rivalry that makes a man contest for higher pay and increases his ability and skill. When he sees men with no experience or skill get as much pay as he does, he says "What is the use?" There is no inducement for one man to be better than another, the best man in the gang will slow down to the level of the poorest man in it, and he sets the pace for all of them. With two jobs before him and no reward for skill or service he becomes indifferent. He overlooks the fact that railroads are in business to furnish service for the people in the form of transportation of freight and passengers and that his duties lie in furnishing his share of the service the people expect. L. D. SMITH,

Supervisor Bridges and Buildings, Norfolk & Western.

NEW BOOKS

Proceedings of the American Wood Preservers' Association, 1920, 6 in. by 9 in., bound in cloth or paper, 370 pages, illustrated. Published by the American Wood Preservers' Association, F. J. Angier, secretary, Mt. Royal Station, Baltimore, Md.

This volume is a complete record of the proceedings of the convention of this association held in Chicago on February 10-12, 1920. The papers and reports presented cover such matters as the scientific study of preservatives and preservative processes, service records secured with various materials preserved under different processes and under diversified service conditions. One report records the results secured with creosoted piles subjected to marine borers in San Francisco Bay for a period of upwards of 29 years. Another deals with the practices of the Delaware, Lackawanna and Western which enables that road to secure a very high service life from its ties. Other papers concern plant operation, specifications for preservative processes, etc. A distinctive feature of this year's volume is a treatise on the fungi which attack tie timber by C. J. Humphrey. This constitutes a classification of a large number of species of these fungi with an account of descriptive characteristics and destructive influences which will enable the student to distinguish between dangerous and harmless species. This description is amplified by the inclusion of eight pages of plates, including three in colors. This feature of the proceedings is also being published by the association under a separate cover with the title, "The Decay of Ties in Storage." The statistics on the quantities of wood treated and preservatives used in the United States in 1919 by R. K. Helphenstine, Jr., United States Forest service, forms an important part of the proceedings, as in previous years.

Railroad Curves and Earthwork, by C. Frank Allen, sixth edition, revised by author. 4 in. by 6½ in., 517 pages, illustrated, bound in flexible leather. Published by the McGraw-Hill Book Company, New York.

The publication of this book forms the sixth edition of the text matter and includes the third edition of the field and office tables arranged especially for railway work by the author. While the original work was prepared for students, the book has proved to be well adapted to the requirements of the practical railroad engineer and subsequent revisions of the original text have kept it abreast of the progress in railroad work. The chapters on circular arcs, the computation of earthwork, and of overhaul, have been extended and several new methods have been added. In the tables, the tables of "Offsets from Tangent for a Ten Degree Curve" have been again inserted, with the addition of a new table of corrections for these offsets. In general, both the text and the tables have had some perfecting changes and in many cases the treatment of the subjects has been simplified.

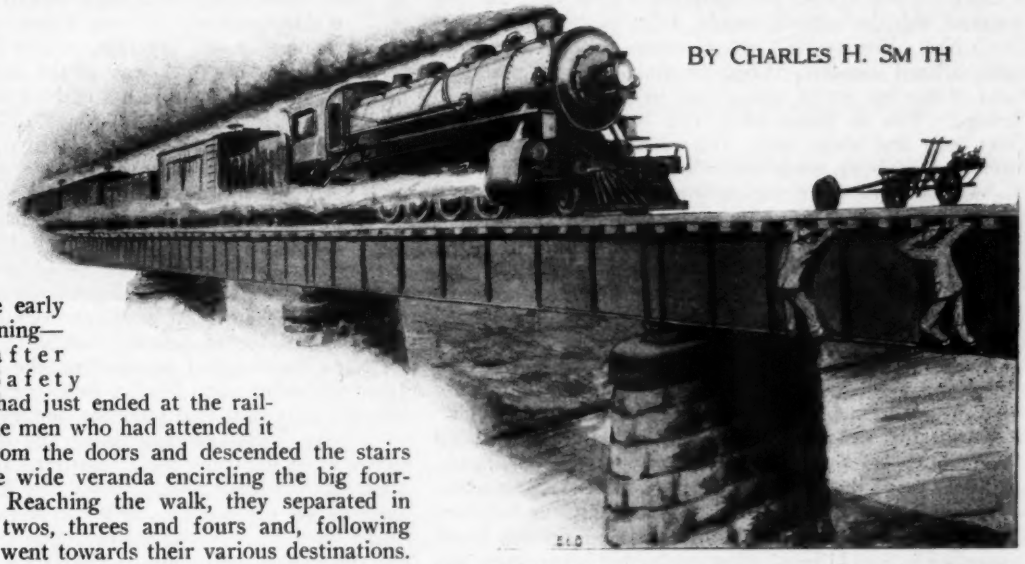
Proceedings of the American Railway Engineering Association for 1920, 6 in. by 9 in., bound in cloth or paper, 1,477 pages, illustrated and including also a separate packet containing drawings. Published by the American Railway Engineering Association, Manhattan building, Chicago.

This year's volumes of the Proceedings of the American Railway Engineering Association follows the standards set in the past as to typography and arrangement except that a supplement consisting of a packet of drawings accompanies this year's volume, this packet being of considerable interest to maintenance of way officers, since it contains 62 drawings of standard turnouts and other track work as well as a separate group of plans illustrating the various forms of concrete construction that have been used for track foundations. The principal characteristic of the Proceedings this year is the prevalence of new specifications covering such branches of railway engineering as iron and steel structures, masonry, rails and track scales. Aside from the committee reports, the Proceedings contain a number of matters of special interest, such as the report of the Special Committee on Stresses in Railroad Track, covering 170 pages of strictly original information secured in the course of an elaborate series of tests. There are also reports on operating results secured in the electrification of the Chicago, Milwaukee & St. Paul Lines and on the unification of railway terminals during the period of government control. The report of the Committee on Iron and Steel Structures, including the annual record of rail failures and special scientific investigations, covers 179 pages.

CAN'T CHANGE THE NAME.—As a result of the Chicago, Burlington & Quincy changing the name of its station at Greencastle, Mo., to "Castel," the right of a railway to name its own station has been challenged by the Public Service Commission of Missouri. The citizens of Greencastle protested to the commission and the company was ordered to restore the original name on its time cards not later than November 12.

THE BEST REASON IN THE WORLD

BY CHARLES H. SMITH



IT WAS quite early in the evening—not much after eight. The "Safety First Meeting" had just ended at the railroad "Y" and the men who had attended it came pouring from the doors and descended the stairs leading from the wide veranda encircling the big four-story building. Reaching the walk, they separated in little groups of twos, threes and fours and, following diverging paths, went towards their various destinations. Most of them were going home.

Not all of the men left the building. Some who roomed there because they lived at the other end of the division strolled out on the broad veranda and seating themselves comfortably in the big square porch chairs, lighted up their smokes. Some few who did not stay at the "Y," but who lived in the nearby city lingered behind to chat with their fellow-workers. Altogether there were perhaps a dozen men seated in a little group behind the railing of the veranda.

The August night was pleasantly warm and the stars shone dimly in the summer-night sky. Behind the building was the big yard and from time to time a switch engine could be heard puffing its way back and forth with ringing bell. Or the deeper and more regular exhaust of a heavily-laden Mikado would tell the men on the veranda that another drag had started on its journey to the other ends of the division. But in front of them lay the open country and even in the starlight the dusky outlines of distant woods could be discerned.

The last of the stragglers from the meeting had disappeared and most of the men on the veranda had been smoking in silence for some little while.

"What do you fellows think of this Safety First dope?" asked Sandy Campbell, a fireman, suddenly breaking the quietness. Sandy had been an "ash-cat" for only two months. "Sounds like mostly bull to me," he added.

For the full space of a minute no one answered him.

"Well, Pal," at last replied "Mex." Flynn, who "broke" for Jack Curtis, conductor on the east local, "you can take it from me, kid, that it's jake. I've been a shack for seven years now and maybe when you've been at the game that long you'll wise up to it that this Safety First dope is O. K. You just got to be on the job all the time, but it generally takes a jolt to make a man 'come to,' though. It did me, anyway. I almost got mine once. And, believe me, once is enough." Mex. gazed out towards the Big Dipper reminiscently.

"Well, shoot!" at last Sandy exploded. "What made you 'come to?'"

Mex. leaned forward and brushed the accumulation of ashes on the end of his cigar against the railing of the veranda.

"I got next three years ago," he began as he settled back in his chair, "three years ago in November. I was called for midnight to go East with a drag. I got up about eleven o'clock, grabbed a snack and started down through the yard. It was windy—cold and windy. Lord, how the wind did blow that night! And dark! Darker than four shades of coal! I had a stogie in me pocket and I decided to smoke it. Now I claim that I can light up in a high wind as well as the next fella', but down in that yard with the wind wiping between those box cars from all directions at once I had some swell chance to get my smoke to burning. I lighted three matches, but there was nothing doing. I stepped in between a couple of empties on No. 8 track to get out of the wind. Never thought a thing about going between cars. A fellow does that every day, you know, coupling up air hose, opening draw-bars and the like of that. That's all right if you're careful and don't pull any boners. You know your train and you know what's going on.

"I hung my lantern on a projecting nut on the end of one car, laid my mittens on the ladder, struck a match and lighted my cigar. But say, fella', it was sure lucky for me that the first match lighted it, too. I had just got it drawing good when I could hear the slack coming towards me like a row of dominoes tipping over."

Mex. paused and took three or four slow draws on his cigar before continuing his narrative.

"I don't know why I stepped out from between those cars. It sure wasn't because I was afraid. I didn't think about anything happening. But I did step out and a second later, zowie!! The slack came and the ends of those two cars came together with a slam. I don't mean just a jolt on the draw-bars, but right flat together so there wasn't room between those cars for a train order. Then I got wise. They didn't either car have a draw-bar in. They were chained up and when the slack came the flat ends of the cars hit. The whole string was a bunch of bad orders going to the shops. My lantern was smashed flat as a pancake and my mittens were cut to pieces. I was lucky—that's all. Got out just in time. I thought I wasn't taking any chances when I went in between those boxes, too. That's the funny part of it. It learn't me that you gotta be on the job *all* the time.

Sandy was impressed and remained silent.

"You said a mouthful, Mex.," agreed Ray Ainsworth,

who worked for the company as a painter. "Only last week I had it put up to me that it don't pay to take chances. Billy Weeks and myself was goin' over the line paintin' signals, switch stands, train-order boards and such like. We couldn't get no motor car and had been usin' a hand speeder. When we got down near this here end of the line we, of course, had to cross the Flat River bridge. You all know what it is—maybe five hundred feet long and about sixty feet above the water. We were comin' down grade towards it at a good clip. Nothin' was in sight. We oughta stopped and listened, but a hand speeder don't run any too easy and we didn't want to lose headway, so we rolled out on the bridge. We was about a third of the way across when a train shot around the curve ahead of us. And I'm tellin' you that he was sure rollin' 'em some down that hill. We tried to make the other side, but we couldn't cut it. So we just nacherly unloaded. They's no place to get out of the way, you know. We climbed over the edge of the ties and dropped down on the girder under the track. Didn't have no time to lose, neither. Just as we dropped down here she come over the bridge, right over our heads. Billy was sure scared and it got my goat, too, for a while. They didn't do much to that speeder. It's in the river now—what's left of it. We were carryin' quite a lot of paint on it, an' I heard afterwards that when they saw that train coming down the line with the engine biler all dec'rated with that mess of yellow, red, black and white paint, they sure thought it was a Bullshiviki special carryin' her own signals. But from now you can take it from me I'm willing to stop, look and listen before hittin' any long bridges er curves."

"You've probably heard fellows say that if a man lived up to the book of rules he'd never get over the road," remarked Tubby Reese, who was a conductor in the "chain-gang." "I used to say that myself—and I believed it, too. I know better know. A man may save five or ten minutes now and then by taking a chance and violating the rules. For a while he may get away with it. But mark my words, sooner or later he's going to get his—and get it hard. When he does he's going to realize then that there's nothing to it. By the time he's blocked the main line ten or fifteen hours as a result of trying to save five or ten minutes he's going to realize that all of his five and ten minute time-saving stuff is going to be cancelled a dozen times over. I know from experience, and I didn't get out of it as easy as you did, Mex. It was mighty near curtains for me."

"How did it happen, Tubby?" asked Sandy interestedly.

"It was simple enough. I had a drag coming west. The dispatcher gave us a message to pick up a load at Lawton. It was a gon.—a load of coal—and somebody had set it out there account of a hot box. It had been re-brassed and we stopped and got it. I noticed from the waybill that the car was overloaded ten tons. Down near Westlake it commenced to run hot and smoke. When we passed Spiritwood it was blazing and I saw that I'd have to do something with it. But we had just time enough to make Wheatland for No. 8 and I decided that I'd take a chance on it running there and then re-pack it or set it out. Before we got to Wheatland the dope had all burned out. A couple miles out of Spiritwood the rear brakeman and I started over the top with our dope pail and irons. We walked within a couple cars of the gon. and sat down where we could watch it. We intended to hop off as soon as we got in the clear at Wheatland and fix it. Well, one mile east of Wheatland the journal burned off and piled them up. The car dropped down and the last thing I remembered was seeing cars going a'l over the right of way in every direction. When I came to I was in the hospital at Bellevue. I heard afterwards it took them seventeen hours to get a hole through that wreck. It was about a week before they got it all cleaned up—cars transferred, wreckage picked up and burned, etc." Tubby laughed. "It was funny, in a way. There I was trying to save a few minutes and I tied up the road for seventeen hours. I was in the hospital over three months—got mixed up with a carload of machinery."

"The trouble is," commented "Dad" Robertson, who pulled BNY-6, the fast symbol freight, eastward every other night, "the trouble is that everything goes along pretty smooth for quite a spell and then someone gets careless. Thinks that nothing can happen. And then somebody has to be injured or killed to wake 'em up again. If every railroad man would be on the job every minute in this matter of taking no chances—of observing safety first—well, they wouldn't need so much room in the hospitals for us fellows, Sandy.

"Eight years ago I was pulling the local over on the Bear River branch. Had a little engine—a goat about like the sixty-nine that pulls the dummy. We were over to Vesper Falls one day doing the switching when I noticed that the water-glass registered full and had registered full for some time, although the fireman hadn't had the gun on for quite a while. I hadn't tried the gage cocks since I got on the engine. You know, that's one of the things that an engineer is likely to get careless about—trying his gage cocks. A man is quite likely to rely entirely upon his water-glass instead of trying his gage cocks now and then to check the amount of water the water-glass shows. Well, when I noticed that my water-glass was full and had been full for some time I decided it was high time to try my gage cocks. I tried the top one. No water. Then I tried the middle one. Nothing doing. Then the lower one. Still nothing doing.

"By this time it had me going. I didn't dare to put the gun on, because I knew that the goat might explode. For all I knew the crown sheet might be red hot. I was pretty nearly up against it for telling what to do. But I finally doped out a way I thought would work. I had the brakeman and the fireman hunt up all the old rope they could find around the freight house and we tied it together, making a rope maybe fifty or sixty feet long. One end I tied to the handle of the injecter. I primed the gun and when she gurgled all of us unloaded and got out of the way behind a box car. Then I pulled the rope."

"Well—what happened?" asked Sandy, impatiently.

"Nothing. Nothing at all. I figured out later that there must have been just enough water in the boiler to keep her from going up when we put the injecter on. Because when we arrived in Benton she was leaking like a sieve. But, lad, I'm here to tell you that since that time I don't rely entirely upon what my water-glass says. It can lie like Sam Hill."

For perhaps five minutes no one spoke. Then Tim Murphy, who had charge of a section in the yard, knocked the ashes from his corncob pipe.

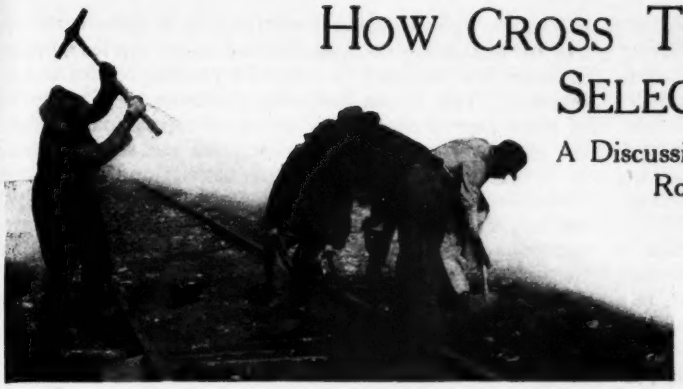
"You min were certainly the careless bunch," he declared as he rose to go home. "Here Oi've been listenin' to your blarney and mished a good hour's shlape. It's a wunder to me that it's not all dead that ye are. Sandy, me bye, Oi've wurrked tin years fer the compiny and niver an accident have Oi had. And all these min that's been tellin' ye how they've been nearly kilt have good reasons fer bein' careful. But it's meself that has the three best reasons fer bein' careful."

"And what are your three reasons, Tim?" asked Sandy.

"Shure, and it's me thray byes that's home and ashlape long ago. Good-night, min."

"Good-night, Tim," they chorused.

And after he had gone no one dissented that after all Tim's reasons were the best reasons in the world.



How Cross Ties Are Selected for Renewal

A Discussion of the Practices Followed by Various Roads to Determine Replacements

ONE OF THE MOST important problems with which maintenance of way officers are concerned is that of tie renewals. To this account is charged approximately three per cent of the total operating expense incurred by the railroads or nearly one-sixth of all maintenance of way expenditures. In 1916 or before the present period of high prices, the charges to this account on the 230,508 miles of Class 1 roads alone exceeded $26,000,000 as compared to approximately $18,000,000 for rail, the next largest single maintenance of way charge. Under existing conditions with a depleted supply and greatly increased prices the problem assumes even greater importance. For these reasons letters were mailed to representative maintenance of way officers recently asking for detailed information concerning the practices followed on their respective roads to determine the ties which should be renewed. The article which follows is predicated on the replies received.

The renewal of ties implies the making of an inspection in one form or another from which the decision is reached as to the ties which should be removed from track and then a follow-up plan of supervision which will disclose the results of the inspection. Plans for selecting the ties for renewal vary widely, ranging from the one extreme where the decision is left entirely in the hands of the section foreman to the other extreme where the foreman is relieved of the responsibility entirely and the decision is made by a supervising officer or a tie inspector who devotes his whole time to the problem. Between the two extremes is the more common plan of divided responsibility whereby the section foreman is given more or less authority with some form of supervision to control any tendency of the foreman to remove ties before the ultimate life is attained.

Each of these three general plans has features of merit. It is argued in favor of the plan whereby the decision is left to the foreman, that, by living with the ties day in and day out, he must have the best knowledge of the condition of the ties and that his assumption of the responsibility in this matter will stimulate his interest in his entire problem. Against this plan it is argued that there is a tendency among section foremen to remove ties from the track that could with safety remain in for a considerably longer period. Carried to extremes this leads to the plan for relieving the foreman from any responsibility in the matter in the belief that the best results can be obtained when the inspection is made by persons interested only in securing the ultimate life of the ties.

The supporters of the third plan recognize the merits of the other two plans and secure the benefit of the section foreman's intimate knowledge of conditions on his section by giving him a voice in the matter, while at the same time controlling any tendency he may have toward removing ties too soon by plans for checking up his work. Of necessity this plan is varied with the amount of supervision which is considered necessary and some of the plans which are followed out with good results are outlined below.

One of the more simple plans of inspection implying divided responsibility is to require, early in the fall, a statement from each foreman in which the tie requirements of his section for the ensuing year are set forth. These statements are studied carefully by the supervisors or roadmasters, and are compared with records showing the requirements of past seasons. Where a marked departure either over or under past requirements is evinced the supervisor makes a personal inspection of the section in question. In the spring the foreman marks the ties selected for renewal, after which the supervisor or an assistant makes an inspection. The Boston & Albany follows this plan closely, and finds that a foreman rarely proposes to remove a tie prematurely. In fact, the opposite is more often the case, and the supervisor finds it necessary to order ties taken out which the foreman wants to leave in.

Inspection in the Fall

A similar plan, but one which implies increased supervision, is followed by the Wabash which requires that a personal inspection be made late each fall by each section foreman to determine the ties to be renewed on their respective sections, during which the ties to come out are marked. The section foreman makes up a list of both cross and switch ties, showing by miles the number of ties to be renewed, classifying these first and second main and side tracks. The track supervisor then takes this list and makes a personal inspection of the ties marked by the section foreman to be replaced over his entire territory. If there are any ties marked by the section foreman to come out that, in the judgment of the supervisor, can be carried over another year or two, he corrects the statement accordingly and forwards it to the office of the division engineer, who in turn makes a check on one mile of each section of each supervisor's division, making any corrections he may think necessary and forwarding the statement for his division to the engineer maintenance of way. When the statement of cross ties required is received in the office of the engineer of maintenance of way, it shows the original number of ties spotted by the foremen for each mile on their respective sections, the number of ties approved for renewal by the supervisor and the number approved for renewal by the division engineer. The engineer maintenance of way spends practically 75 per cent of his time on the road and a great deal of this time on motor car or walking track, and he personally inspects the cross tie conditions at various points where the recommended renewals may be heavy or out of line with the annual renewals in the same territory for preceding years, and makes his recommendations to the management accordingly.

The Chesapeake & Ohio requires its section foremen

to make a careful count during January and February of each year, of the ties which are to be renewed during the season on each mile of track, and to send in statements. These statements are checked by the supervisors and division engineers, who, on their motor car inspection trips, take a mile or two of track at random on each section and count the ties to be renewed, thus checking the section foreman's count and judgment as to renewals. If it is found that a foreman has not used good judgment in his estimate of renewals, his entire section is recounted by the supervisor. After this is done the statements are compiled for the system and are used as a basis of distribution, where ties have not been distributed previously.

The maintenance of way organization on this road provides for inspectors of track, who are practical track men of long experience and keep constantly on the line, instructing the forces as to proper methods of performing work and maintaining standard practices. These inspectors, who report direct to the superintendent of maintenance of way, are furnished with a detailed statement of the ties required on each mile of track and are required to check, by personal count from time to time, the count of the supervisors and foremen.

On the Union Pacific the section foremen and district roadmaster check over the ties in the track during the month of August, making a note of the number of new ties which will be required during the succeeding sixteen months, from mile post to mile post. Their report is later checked by the division roadmaster, division engineer and division superintendent, and the number of ties on hand or on order, yet to go in at time the inspection is made, is deducted from the total quantity needed and the order placed for the following year. The mile post to mile post inspection sheets are used as a guide by the section foreman in unloading ties as they arrive. Ties arriving for the current year are distributed individually along the track, while any arriving for the succeeding year are placed in piles at sidings or on high ground where they can be protected against fire or theft.

MARKING THE TIES FOR RENEWAL

The Erie requires its track supervisors to start a personal inspection of ties in track immediately after the frost leaves the ground in the spring. During the inspection the ties which require renewal are marked. The supervisor is accompanied over a section by the foreman in charge of that section, as well as a laborer who carries a paint pot and brush for marking the ties. The supervisor, before marking a tie for renewal, is required to test it both by sounding and by driving a sharp pick into it under the rail seat. If this indicates a need for renewal the laborer places a white spot on the web of the rail, the location of the spot being uniform over the entire railroad.

Upon the completion of the tie inspection on any one section, a report is made by the track supervisor in duplicate, one copy going to the division engineer, and the second to the superintendent of maintenance. This report is divided into quarter-mile units. Upon its receipt the division engineer is required to examine it, and should the inspection indicate that the renewals will run over 10 per cent, the division engineer is required to satisfy himself that the inspection is correct.

The Great Northern follows a somewhat similar practice, the tie renewal inspection being made in August and September. The inspectors are the roadmaster, section foreman and a laborer for their respective sections and districts. The laborer carries a stamping tool and marks the ties the foreman and roadmaster decide are to be taken out. The foreman carries a pick or other suitable tool for examining ties and the roadmaster carries a book in which are recorded by miles the number of ties to be renewed. This record facilitates distribution. The work of these men is checked by the division roadmaster and the general roadmaster, who examine the stamped ties in several miles of track on each district and determine what modifications should be made in the work done by the inspectors. If it is found that more ties have been marked for renewal than it is necessary to take out, the inspector's returns are reduced by a certain percentage. Likewise if it is found that enough ties have not been marked, the returns are increased by a certain percentage and requisitions are submitted in accordance therewith. It is understood that the division roadmaster and the general roadmaster do not examine every mile of track on a district but do examine enough track to obtain an accurate gage of the inspector's work and their modification of the inspector's returns can be considered an accurate estimate of tie renewal requirements.

ANY ABNORMAL CONDITION MAY BE CHECKED UP

With the tie inspection made and checked a report thereof accompanied with requisitions is submitted to the office where a further check of renewal requirements as compared with those extending over a period of 10 years is made. If this check develops that an unusually large number of ties has been ordered or vice versa, the superintendents are asked to explain the reason therefor and in some instances are instructed to make a reinspection. Such instructions, however, are very seldom given since the inspection usually gets at the facts and general officers are willing to accept the returns. In conducting the inspection the inspecting crews usually cover a section a day or approximately six miles of track.

Another method of inspection, which is followed by the Illinois Central with satisfactory results, is to have each section foreman go over his own section in advance of the tie renewal season, marking all ties he thinks should be renewed. After this is done the district supervisors make an inspection independent of the foreman, and the supervisor's check of the ties which should be removed, when it does not agree with the foremen's check, supersedes the foremen's check and ties are then marked for renewal.

In addition to the check made by the supervisors, each roadmaster (division engineer) makes a personal check of a limited number of sections on the various districts to see that there is no marked error in marking ties to be removed, and that there is no inconsistency for the ties marked for renewal on the various districts of his division. He then makes his recommendations to the engineer maintenance of way as to the number of ties to be put in on the basis of the check made by the foremen and supervisors but with changes if, in his opinion, changes should be made. No field check is made by anyone having jurisdiction, beyond the limits of one division to insure that tie renewals are uniform among the various divisions, but the recommendations of the various roadmasters are compared with each other and with the charts showing renewals for past years to see that they are not out of line. In case any recommendations appear inconsistent in these comparisons, an investigation is then made to determine why and to check the recommendations.

When it comes to applying the ties in the tracks the section foremen on the Union Pacific are held to the number allotted per mile. The exact tie which shall be changed out is not specified in advance as it is a well

known fact that a tie which looks all right on top may often be found, on opening up the track, to be rotted out beneath and vice versa. However, in making the renewals, a foreman is not expected to change out more than two consecutive ties, but rather from year to year to lace the new ties in alternately with the old ties. This is not a rigid rule as safety of the track is the chief consideration, but in every case where a foreman bunches his renewals he is required to explain and must have a good reason if he is to avoid disciplinary action.

To insure that ties are not being removed from track prematurely all old ties taken out of the track must be left on the ground until inspected by the district roadmaster. After this inspection has been made the ordinary disposition is to use them for fuel; sell them to private parties living near the track or trade them to farmers in return for their work of plowing fire guards, cutting weeds or performing other necessary work. The last resort is to burn them where they lie along the track in order to get them out of the way of scythes and mowing machines and to clean up the right-of-way.

On the Erie the actual renewal of ties is started upon instructions from the office of the superintendent of maintenance. This is done as early in the year as is possible. With favorable weather conditions the forces on parts of the line are actively engaged on their renewals by March 15, and on nearly all of the line by April 1. The spots marked on the rail indicate the ties that the section foreman is authorized to renew. He cannot go beyond this, except to renew broken ties or those ties which are covered up by crossing plank and which cannot be inspected without their removal.

To Insure that Ties Are Not Being Removed from Track Prematurely All Old Ties Taken Out of the Track Must Be Left on the Ground Until Inspected

Starting with the renewal of ties the track supervisor makes a weekly report to the division engineer and the division engineer in turn to the superintendent of maintenance. This report shows all ties renewals for the week, the total number of miles of track in which renewals have been completed and space is provided on it for explanation of any difference between the ties spotted through the mile and the number of ties actually renewed. An examination of reports indicates fully as many cases of under-run as over-run in these items, as all section foremen have been repeatedly cautioned not to remove a tie if, after having taken out the ballast, it shows such a condition as to warrant leaving it in track.

This system was devised to secure a close inspection of renewal of ties. At first thought it appears that a considerable extra duty is imposed on the track supervisor by requiring him to make this personal inspection. Actually, however, no particular difficulty is experienced by the supervisors as, by inspecting a mile or so on each one of the sections before trying to complete any one of them, they are able to keep well ahead of the actual renewals. The knowledge they gain of the actual condition of their ties in track, is a decided benefit to them in the carrying out of their other work, and by having the same man carry out the inspection year after year he knows at all times what his requirements will be and how far he can go safely in conserving his tie renewals. For two or three years the policy of appointing an extra section foreman, or, in some cases, a carpenter to take care of the tie inspection was adopted. The results obtained, however, were not as satisfactory as having this done by the track supervisor.

INSPECTING THE TIES REMOVED

All ties taken out of the tracks of the Chesapeake & Ohio are piled. No ties are burned or otherwise disposed of until authority is given by a superior officer. The officers in charge of maintenance frequently inspect the removed ties, in company with supervisors and foremen, to see that no ties have been removed before they should come out and to see that all ties which should have been removed have been taken out.

A record is kept in the office of the superintendent of maintenance of way showing the tie renewals on each mile of track each year. This is used as a further check of each year's renewals and the average life of the ties. In this way the section foreman is made responsible for his section, and it is the endeavor to educate him up to that responsibility and cultivate in him a feeling of pride for the proper conduct of the maintenance of his section. He knows by experience that the renewals will be checked and that before he has gone very far with the season's work some officer will inspect his work and instruct him as to whether or not he is using good judgment in his tie renewals. In the last few years by systematic personal instruction of section foremen on their work and by carefully watching the tie renewals, the annual renewals have been reduced materially and the average life of ties in the track increased almost a full year. In addition, the average condition of timber in the track has been greatly improved.

On the Lackawanna the large percentage of ties used in the main tracks are treated ties. In fact, all of the ties used in heavy running main line tracks are treated. This practice has been carried on since January, 1910. Therefore, untreated ties remaining in the tracks have attained a minimum life of nine years and the question of their removal is not serious, for the reason that practically all ties remaining in tracks have reached a maximum untreated tie life. However, the roadmasters and supervisors are compelled to make a careful examination of all ties, upon their respective divisions, rendering a statement to the office of the principal assistant engineer covering

the ties for removal. The section foremen have positive instructions to see that no ties are removed other than those indicated by either the roadmasters, supervisors or an inspector delegated for such work.

Every treated tie removed from track must be recorded and reported on a form provided for the purpose and a careful tabulation is made, both in the roadmaster's office and the principal assistant engineer's office. Treated ties which are removed because of decay are either held for inspection or shipped to the treating plant for a careful examination, photographic, etc. Ties destroyed by wrecks and otherwise are not disposed of until a careful inspection has been made to ascertain whether or not they can be used for other purposes.

The Economical Use of High-Speed Steel in Drill Bits

BY A. T. KIPPING,

General Scrap Dock Foreman, Chicago, Rock Island & Pacific, Silvis, Ill.

HIGH-SPEED steel is the highest priced item of raw material purchased by the railroads, the recent market price being about $1.25 per pound. The high percentage of tungsten in this steel is the principal reason for the high price.

The presence of tungsten causes the steel to become extremely hard when it is exposed to the air after being heated to a high temperature. This steel also possesses the quality of resisting abrasion to a considerable degree and retaining its cutting edge at a comparatively high temperature. High-speed steel is used on a railroad for machining metal and in the maintenance of way department, principally for track drill bits

Instead of following the original practice of the manufacturers, i. e., making the bits from solid pieces of high-speed steel, the Chicago, Rock Island & Pacific developed a plan for making these drill bits whereby a shank of scrap tire steel has a tip of high-speed steel taken from scrap welded onto it. While this method was being worked out, many of the bits were improperly welded and the joints twisted off the first time any strain was put on them. This caused a great deal of dissatisfaction with these shop-made bits, but as the work was continued the method was perfected and a very good article produced.

The method now used is as follows: Both the tire steel and the high-speed steel are beveled on one end and spot welded with the electric welder to prevent them separating when placed in the fire. They are then slowly heated to about 2,100 deg. F., which is nearly the maximum heat the high-speed steel will stand. When the proper heat is attained they are placed in a die and lap-welded under a steam hammer, the tire steel and high-speed steel being forced into the recess in the die, similar to the method of making a drop forging. The tire steel can be safely heated to a much higher temperature than the high-speed steel and, of course, the greater the heat the better the weld, providing the high speed steel is not overheated, as under such circumstances it will break when struck by a hammer.

Fear of overheating the high-speed steel is what caused many of the poor welds when this method was being worked out, but if a temperature of 2,100 deg. is used, a good weld can be obtained. After welding, the bit is exposed to the air and cooled, then the fin is ground off, the bit is sharpened and the two side edges slightly rounded so as to facilitate the operation of drilling.

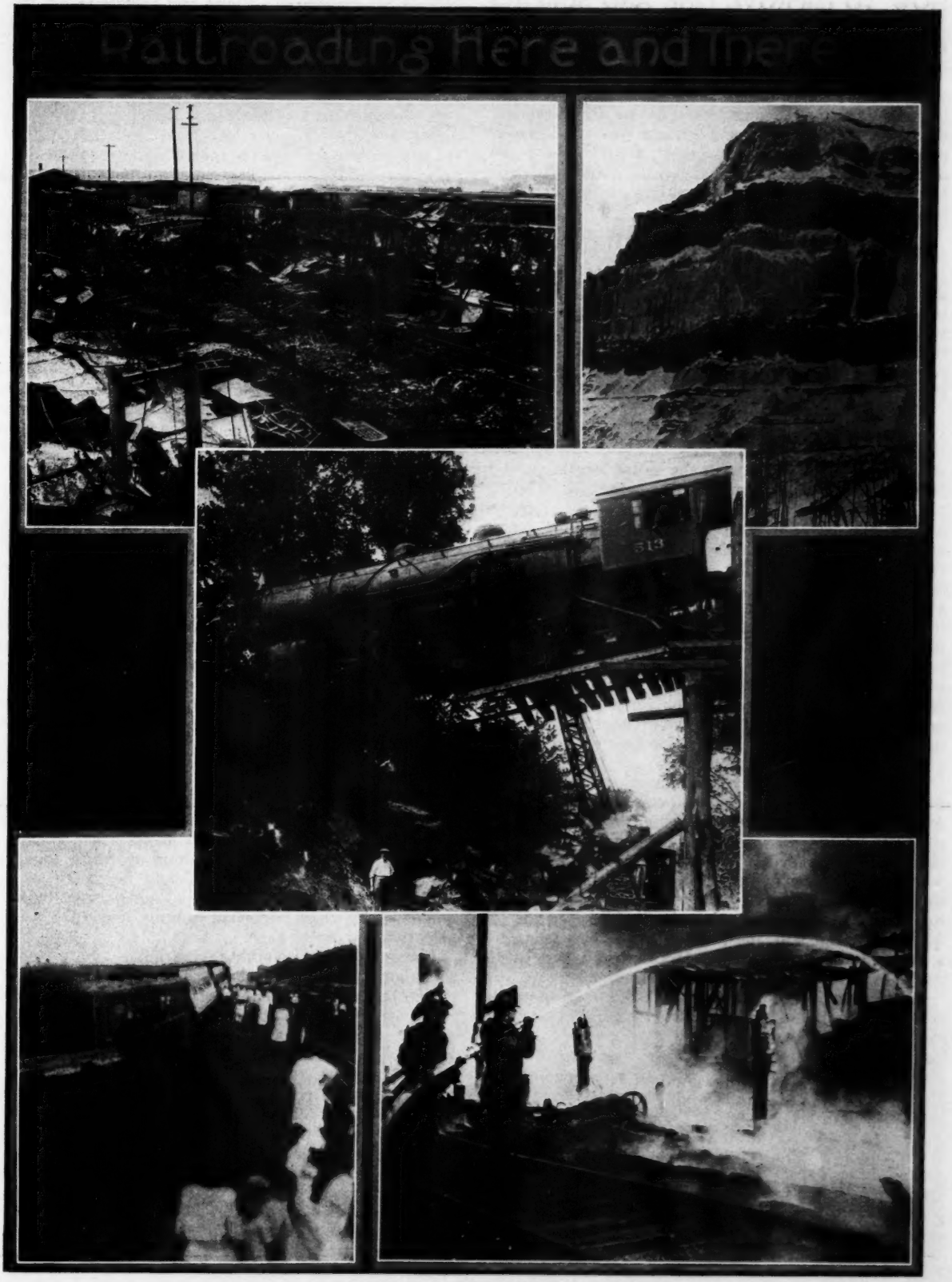
It has been found most practicable to use high-speed steel tips 1½ in. to 2 in. in length to get the greatest efficiency, both from the standpoint of conservation of the supply of steel and the length of service to be obtained from the bit. In a new bit, this practice places the weld about midway between the point and the front end of the chuck on the drilling machine, or at the point where the strain is greatest. Consequently, it is most important to get a perfect weld. But no matter how perfect the weld, the bit can be broken easily by misuse; in fact, many bits made from a solid piece of high-speed steel are broken because of misuse.

A track drill bit may be misused in various ways. It may be used after it needs sharpening and then the automatic feed on the drilling machine will crowd the bit against the rail faster than the dull bit can cut, thus causing an undue strain. The bit may not be gripped tightly by the jaws in the drill chuck. This will allow it to get out of line from the drill spindle and work at a slight angle, causing a bending strain. It is often the practice to fit angle bars into place before drilling a rail and then drill through the angle bars. If the bolt hole in the angle bar on the far side does not come exactly in line with the bolt hole in the bar on the near side, the bit will be unduly strained when it strikes on one side only of the bolt hole.

It is very important to get the point of the bit exactly centered and the face of the bit properly beveled. With the attachments furnished by manufacturers of grinding machines, this can easily be accomplished by anyone, even if inexperienced. It sometimes happens that a piece of steel will break from the face of the bit on account of a defect in the steel, or due to misuse. If the bit requires grinding more than ⅛ in. to remove the defect, it should not be ground at all, but should be sent to the shop to be redressed, as this will not only save a waste of high-speed steel, but will insure a better cutting drill bit. Of course, this will depend on whether the broken bit can be released from service without causing a delay to work in progress.

The fact that solid high-speed steel drill bits cost $3.49 each for 15/16-in. size and $3.75 each for 1 1/16-in. size during 1918, and bits of these sizes with high-speed steel tips could be made for $1 each, proves that this practice is economical, providing that the article produced is serviceable. To ascertain whether or not the welded bits were as serviceable as the solid ones, a lot of them which had been sent to the main repair point for repairs were inspected, and out of 83 defective bits only 28 were with welded tips. This inspection was conducted after the welded bits had been in use about two years and constituted the majority of track drill bits in use on the railroad. The fact that the number of solid drill bits that failed exceeded the number of welded bits, although not a conclusive proof, gives a very good idea of the serviceability of the welded type.

Another test was made with three welded bits, selected at random from a large stock. These were kept in almost continuous service for six weeks and were given proper attention to keep them in condition. They showed no signs of twisting or of opening at the weld. There is no doubt that if the welded bit is not misused it will give good service and afford the opportunity of putting into effect a very economical practice. As a result of this method a saving of $9,242 was made on the Rock Island during the past two years.



RECENT HAPPENINGS OF INTEREST TO RAILWAY MEN

Fire in Burlington yards near Chicago destroyed 160 cars and caused a loss of $1,000,000. Two 40-ft. coal veins on the Nenana river soon to be tapped by the Government Railway in Alaska. Monon locomotive forms its own bridge when broken trestle bent falls. Wreck of Governor Cox's special at Phoenix, Ariz., a forerunner of the disaster to follow. Second Chicago fire destroys 94 more loaded cars and the Chicago Junction freight station.

Credits—Top, International Film, Ewing Galloway, N. Y. Lower three, Underwood & Underwood.

HOW TO IMPROVE LINE AND SURFACE

ONE OF THE most gratifying results of the efforts made by the officers of the Kansas City Southern in organizing its own maintenance of way association is the excellent discussions which have been brought forth in the meetings. As an illustration, the matter of improved line and surface was considered at one of the meetings, in the course of which two papers on the subject were presented. G. T. Anderson, roadmaster at Spiro, Okla., who read one of these, spoke in part as follows:

Uniformity in the work is essential in putting up track that will remain for considerable time. First-class track cannot be put up without the use of tamping picks or tamping bars, especially in gravel or stone ballast, and it is quite often necessary to go over some of the track which has been surfaced and tamp up some of the joint ties and low places that have developed after trains have passed over. This usually applies where track has been given a lift of two inches or more.

The question which is frequently asked and discussed by track foremen is, "Should the tie be tamped throughout its entire length?" Unquestionably a tie should be tamped throughout the entire length, so as to furnish as solid bearing as possible for the rail. This applies where track is being raised two inches or more, but care should be taken that it does not become centerbound, or in other words, the center of the tie should not be tamped as hard as the shoulder, or end of the tie. Since it has become necessary to use so many inexperienced men who have not been in the service a sufficient time to become interested in the work or learn how to do the work properly, in my judgment the tampers should be organized to tamp the track in the following manner. However, this method would apply only to surfacing gangs, as ordinarily section gangs have only four or six men, so that their work can be watched closely by the foreman, and proper supervision be given in order to get good work that will stand up.

If we have four pairs of men tamping the end of the tie on each side of track, the head pair should tamp every fourth tie, the next pair the tie behind, and the third pair the third tie, etc. The men tamping the centers of ties should follow a similar system. Besides keeping the work close together without interfering with each other, this method would make it possible to get more work out of these men who would otherwise "soldier" on the job. More important still, the track as a whole is tamped in a uniform manner, due to the fact that in a gang of any size there will be some good experienced men.

When the raise is small and roadbed is solid the tamping bar is the most efficient tool we can use. It is seldom, however, that tamping bars are profitable in surfacing new track or track where improper drainage causes soft roadbed. It requires more time to tamp a tie with a tamping bar than a shovel, especially in gravel or chat ballast, and if the subgrade settles, the track will settle, no matter how well the ballast has been tamped under the tie. It is difficult for most new foremen entering the service, not having had experience with soft track, to take hold of a section and handle the raising in a satisfactory manner on track that is effected by soft roadbed. Therefore, in selecting a foremen for a section of this kind, great care should be exercised.

It often occurs in passing over a section of track that it looks to be in uniform surface, yet it rides rough. Each individual rail may appear to be in fair running surface. Yet if the track is out of cross level, running low, first on one side, then the other, this condition causes the weight of the train to be thrown unequally on the rails, causing the roughness. Under this condition, the tendency of the trains is to increase settlement on the low side, which results in the track becoming rougher. By using the level board, this defect will be corrected.

Some foremen make a mistake by thinking they can tell when the track is level by the eye. I have often heard track foremen make the remark that they can surface the track without using a level board, but I have never see anyone prove it in a test, therefore, my conclusion is that a level board should be used at all times in surfacing and leveling up track.

Foremen can test straight track, first by finding a spot where the track is absolutely level, placing the level board on the handcar crosswise, block it to road level, then push the car along slowly, and notice how the bubble varies, and where low rail changes from one side to the other. Our present method is to place the level board on every half rail length. However, this would consume more time than the method just mentioned.

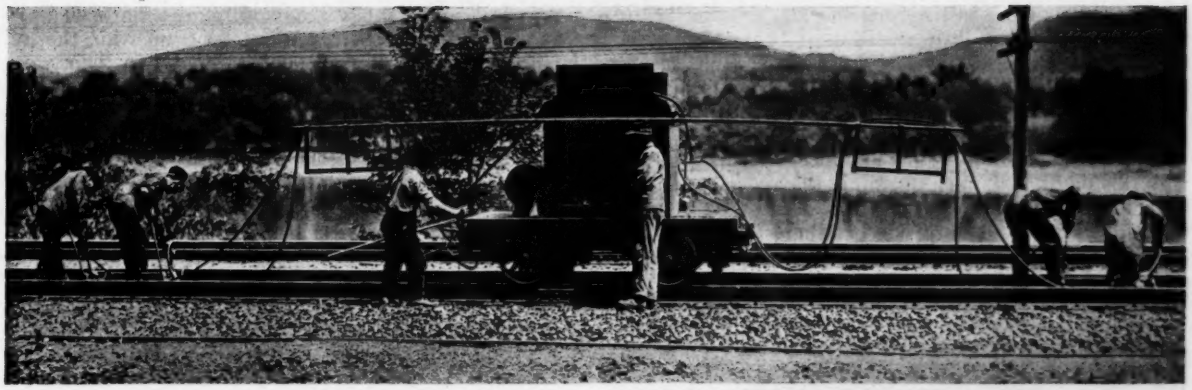
In my judgment, the foremen should ride over their sections occasionally on the engine or rear end of trains, preferably the engine, noting how the engines and cars ride and what causes good places and bad places. A train running at the rate of 45 miles per hour will not ride as smoothly as one running at 25 miles per hour, for cars running at the lower rate of speed have more time to right themselves after the wheels meet the places out of line, gauge or surface. When a train runs along smoothly, then suddenly swings to one side, there are three possible defects to which the cause may be contributed: Track out of line, surface or gage.

There are many things other than weak foundations which make low joints in track. A few low joints permitted to remain will result in the cross level of the track becoming worse. Loose bolts will make low joints, because when they become loose they permit angle bars to bend down under the weight of the engines or cars. Bad gage will also make low joints, as the cars, when trains run fast, are thrown heavily from one side the track to the other, and the joints being the weakest point, are affected most.

Improper expansion between the rail ends will also result in making low joints, as they assist the car wheels in battering the rail ends, which makes a bad condition in a very short time. In smoothing up track, joints in such condition as mentioned should be raised ¼ in. higher than the balance of the rail and tamped up with tamping bars. It is important to bring joints to a proper gage if found out of gage.

Lining Track: Nothing contributes more to the smooth riding of trains than true line of track. Track should be kept in perfect line at all times. Very few men can line track perfectly by going over it once. To do this, they must be experts and have a perfect vision. One should always stand as far away from the place to be lined as his vision will allow, for when standing too near one is liable to throw a swing in the track. This is a fault of many foremen, which should be avoided.

If you have a piece of track left in bad condition by some previous foreman, the succeeding foreman should show his ability by working out its defects every time he has an opportunity. After the track has been properly surfaced and gaged, it should be put in perfectly true line. The surface may be perfectly level and smooth, but cars will ride badly over it at a high rate of speed. The wheels follow the crooked line and bad gage causes the cars to swing almost as if the surface of track was rough. Further, bad line and gage will soon make the surface rough. When we have sufficient ballast for surfacing and leveling up the track, all that is required is a little skill, care and a good eye, and force enough.



Bonding 100 Rail Joints Per Hour.

REDUCING THE LABOR ITEM IN RAIL BONDING

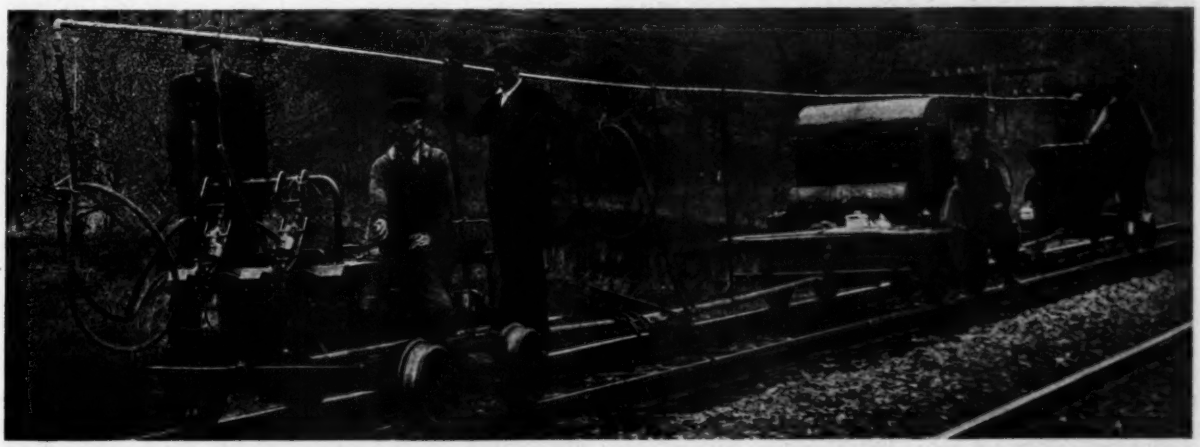
Lehigh Valley Develops an Efficient Method Requiring Less Men and Increasing the Output

IN RELAYING RAILS one of the problems which it has been most difficult to overcome has been that of keeping the men steadily at work. The task of the tong men in removing the old rail and placing the new has always been extremely laborious, while that of the drillers preparing the bond holes is both fatiguing and monotonous. It has not been uncommon to have men leave the work at different times throughout the day because of its character. With an abundant labor supply as in the days before the war this was not such a serious difficulty as at the present time.

In an endeavor to reduce the drudgery to a minimum the Lehigh Valley developed a plan some time ago of relaying rail by using locomotive cranes. This was described on page 178 of the May, 1918, issue of the *Railway Maintenance Engineer*. The use of this method has resulted in speeding up the work with less hardship to the trackmen. Since the adoption of the locomotive crane for laying rail the main drawback to this work has been the bonding. The difficulties attendant on this work have now been overcome by the use of the machine shown in the illustration. With it the men have done better work, a less number have been used, there has been no necessity of relieving men on account of the laborious character of the work and the bonding has been completed within a few minutes of the rail laying.

Two arrangements have been developed, one on the Wyoming division and the other on the Seneca division, which are similar in their general plan but which differ in their methods of operation. In general they consist of an air tamping machine to which four pneumatic drilling or bonding machines are attached by lengths of pipe and air hose. In one case the machine was moved by hand and in the other two motor cars were used.

The smaller outfit was built up by fastening a 21-ft. length of 1¼-in. pipe to the side of the air compressor and parallel to the track in such a way that it cleared the top of the rail by about 5½ or 6 ft. A reinforced U-shaped bracket with hooks made from scrap iron was fastened to each end of this pipe as a support for the air hose, upon which the air drills could be hung when not in use, or when moving from one location to another. A two-way connection was attached to the outlet pipe of the tamper to which there was attached a second two-way connection and a short length of air hose. This section of air hose was carried over the top of the tamper and a third two-way connection made fast to it. A 25-ft. length of hose and an air drilling machine was then connected with each of the four outlets so formed. This gave two machines on each side of the air compressors, each machine drilling one side of a joint and the four machines drilling the bond holes for two rail

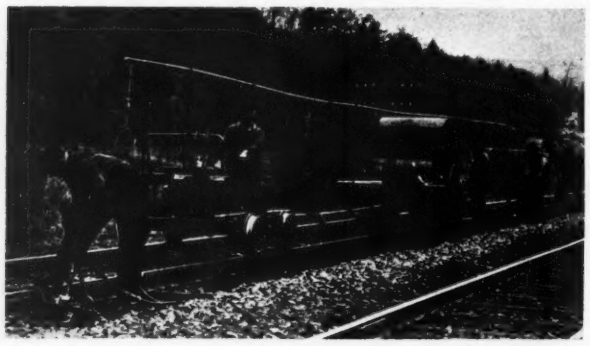


Moving the Compressor and Equipment to the Next Set-up with Motor Cars

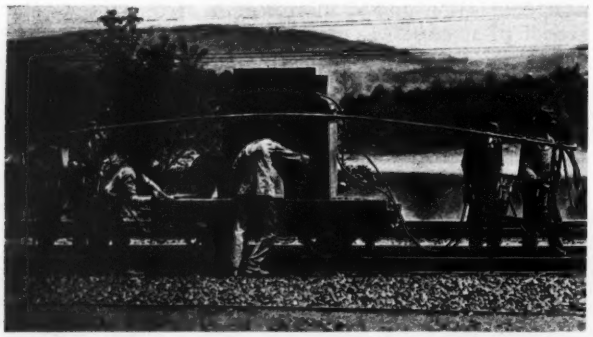
joints at one time. In handling the machine the 1¼-in. pipe proved to be a little small, as it bent considerably when the four air drills and hose were hung on the brackets, and it will therefore be changed in future installations to a 2-in. pipe made slightly longer, but not to exceed 25 ft. in length.

As will be noted in the photographs, six men are used with this outfit, four men operating the air drills, one the air compressor and one to push the entire outfit. Where the gang is working up grade or where it is desired to cover the ground at a little faster pace one man may be added to help push the machine.

The second arrangement consisted of an air compressor of a similar nature and two motor cars. These three units were connected together with the compressor in the center by means of two 20-ft. lengths of 2-in. pipe, flattened at the ends in order to bolt them to the cars and to the compressor. Four drilling machines were used as in the preceding case, arranged so that there was but one machine to a joint. The air was supplied by means of about 80 ft. of ¾-in. pipe mounted above the air compressor and supported at each motor car by two uprights fastened to the framework of the cars, and by two 5-ft. 2-in. uprights clamped to the 2-in. pipe connections at a point on each side of the air compressor.



The Three-Unit Arrangement in Operation



Ready to Move the Car One Rail Length by Hand

Connections were made with the air drilling machine to short lengths of hose, the two center lines being approximately 8 or 10 ft. long and the end ones about 15 ft.

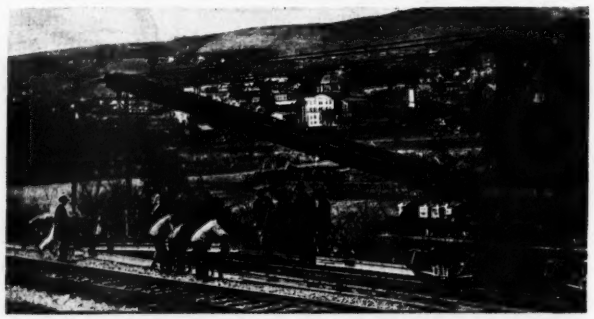
With the completion of the drilling at each of the four joints, the air drills are suspended on hooks provided for that purpose and the outfit moved ahead under its own power. In this case the men do little or no walking and the movement from one set-up to another is accomplished in about 20 sec. The motor cars are utilized to carry such additional equipment as is necessary, such as extra drilling machines, air lines, drills, bonding wire, etc.

The results obtained by the two outfits show that the number of men usually required for the work was considerably reduced, the bonding kept up with the rail laying and the men were kept interested in their work. As stated before, six, or in some cases seven, men were used with the hand-pushed machine. With the self-propelled arrangement a total of ten men were used, four for drilling, two for bonding, one to look after "bootleg" wires and one to operate the two motor cars and the air compressor. The bond wires were distributed by the man operating the forward motor car.

To do this work under the old method would require about 19 men, which would include 14 drillers, two bonders, one to look after "bootleg" wires, one to distribute bond wires and one to look after the machine and to sharpen the drills. In addition, considerable more time would be spent at this work under the old way, as this number of men would be required to work about two hours after rail laying was completed in order to finish the bonding.

A total of 730 holes of ⅜-in. diameter were drilled by the smaller unit in 3 hr. 36 min., and a total of 1,672 by the larger unit in a working time of 7 hr. 30 min. In both cases the results were not indicative of the amount of work which could be done with these outfits in a given time, as both were delayed considerably by the rail layers.

At one point, 354 lengths of 136-lb. rail were unloaded, laid and the old 100-lb. rail picked up in a total elapsed time of 6 hr., the bonding being completed 16 min. after the track was connected. The drill replacement record in this case was exceptional, for only six drills were replaced in drilling 730 holes at the rate of 203 holes per hour. Furthermore, two of the six drills were broken accidentally. Each of the four drills was numbered and a record kept of the performance of the machine, and in each case the drill completing the work was still in serviceable condition. No. 1 machine drilled 26 holes and then 158. No. 2 machine had three replacements, drilling 81 holes with the first drill, then 12, 17 and 72, respectively, with the replacements. No. 3 machine had one replacement and drilled 131 and 53 holes, respectively. No. 4 machine drilled 24 holes, when the drill was replaced, and then finished by drilling 156 holes. Considering that the average number of holes per drill which has been secured heretofore by the hand method is about 14, there was a saving in this case of 46 drills, which at present prices would amount to $40 or $45 in less than one day's work.



Laying 136-lb. Rail with a Locomotive Crane

We are indebted to G. L. Moore, engineer maintenance of way of the Lehigh Valley, for the photographs and information contained in this article.

POLITICS PROHIBITED.—D. B. Hanna, president of the Canadian National, has issued an order that employees of that system would not be allowed to run for political offices, the penalty being dismissal from the road.

BRIDGE AND BUILDING MEN MEET AT ATLANTA

Large Attendance, Practical Reports and Active Discussion Contribute to Successful Convention

THE THIRTIETH annual convention of the American Railway Bridge and Building Association, which was held at the Piedmont hotel, Atlanta, Ga., on October 26 to 28, was one of the most successful in the history of this organization. The total registration was 250 members, over 100 of whom came from Chicago and points west on a special train of eight cars via the Big Four and the Southern railways. A total of 82 new members were elected during the course of the convention.

The officers for the past year were: President, F. E. Weise, office of chief engineer, C. M. & St. P., Chicago; first vice-president, W. F. Strouse, chief engineer, Public Service Commission of Maryland, Baltimore, Md.; second vice-president, C. R. Knowles, superintendent of water service, I. C., Chicago; third vice-president, Arthur Ridgway, assistant chief engineer, D. & R. G., Denver, Colo.; fourth vice-president, J. S. Robinson, division engineer, C. & N. W., Chicago; secretary-treasurer, C. A. Lichty, purchasing department, C. & N. W., Chicago; members executive committee, J. P. Wood, supervisor of bridges, P. M., Saginaw, Mich.; A. B. McVay, supervisor of bridges and buildings, L. & N., Evansville, Ind.; J. H. Johnson, G. T., Montreal, Que.; E. T. Howson, editor, *Railway Maintenance Engineer*, Chicago; C. W. Wright, master carpenter, L. I., Jamaica, N. Y., and A. Manthey, D. S. S. & A., Marquette, Mich.

F. E. Weise
President

The convention was called to order by President Weise at 10 o'clock Tuesday morning and was opened with prayer by C. A. Lichty, secretary. The association was welcomed to Atlanta by Hon. James L. Key, mayor, and Eugene Black, president of the Chamber of Commerce. E. T. Howson replied to this welcome on behalf of the association.

In his opening address the president referred to the period of reconstruction through which the railways are now passing and emphasized the necessity of restoring the physical condition of the structures as well as the morale of the forces. In closing he referred to the fact that three past presidents of the association have died during the year, Joseph H. Cummin (L. I.), B. F. Pickering (B. & M.) and A. Markley (C. & E. I.).

The report of the secretary-treasurer showed over eighty applications for membership and a balance of $1,300 in the treasury.

REPORT ON THE ABUSE OF TREATED MATERIAL

THE PURPOSE of treating timber is to prevent decay and to extend its life. This result is usually accomplished by impregnating the timber with a preservative, creosote oil being generally used for timbers in bridges and other similar structures.

The efficiency of the treatment is dependent upon and is usually measured by the depth of penetration and the extent to which the untreated portion of the timber is sealed against decay by the treatment. It is obvious that anything done to the treated timber which tends to lessen the thickness of the treated area is abuse and destroys the effect of the treatment to the extent that the treated area is reduced. While it is a recognized fact that it is often necessary to cut or frame treated timber after treatment, much of the framing can and should be done before the timber is treated, and whenever it is actually necessary to frame treated timber care should be exercised to see that the work is done in an intelligent manner and with as little damage to the treatment as possible and that hot creosote oil is applied to the cut portion of the timber.

When treated piles are cut off after driving, the tops of piles should be thoroughly coated with hot creosote oil. It is not enough to paint the tops, but oil should be applied as long as the timber will take it. When boring holes in treated material, holes should be made slightly smaller than the bolts so that a driving fit will be obtained. It is still better to pour hot creosote oil in the holes before driving the bolts. Where piling is not in proper line after driving, a treated pile should never be adzed to make the bracing fit up, but if the piles are greatly out of line blocks should be applied to the piling to bring the bracing in line. The end penetration on a well-treated timber is usually from 3 to 6 inches in depth, therefore an inch or so sawed from the end will not materially affect the life, but any framing of treated timber that penetrates the area of treatment certainly tends to destroy the effect of the treatment.

In unloading creosoted timber care should be taken to see that it does not drop from too great a height to the ground. Treated timber is more susceptible to damage from this cause than untreated timber on account of the lessened strength of the timber through treatment. Creosoted material should not be mistreated with bars, picks, cant or lug hooks in such a way as to make holes extending through the treatment. Frequently holes are bored in treated timber and left unfilled. These holes should always be plugged with plugs of treated timber. In general all portions of treated timber which have been cut or bored below the penetration of the creosote should be covered thoroughly with hot creosote oil.

There is no longer any guesswork regarding the results which can be obtained through the use of treated timber. Standard practices have been developed that can be relied upon, so that, with proper supervision, results of a definite quality may be obtained. Permanence

in service requires the proper penetration of the preservative in the timber treated, and this can be obtained only by the use of proper timber, proper methods, proper preservatives, proper equipment and careful supervision, through all stages of the operation of treatment.

The conclusions of the committee were: (1) That all treated material should be thoroughly air seasoned before treatment; (2) that material to be seasoned for treatment should be piled under proper conditions so that it will have a chance to properly air-season; and (3) that the yard in which the material is to be piled should be thoroughly drained, kept free from weeds and enough space provided between the piles to allow the air to circulate thoroughly; (4) that it is just as necessary that extreme care be taken in the handling of material after treatment as it is before treatment. This insures that the value of the treatment will not be destroyed, thus in loading and unloading treated material the utmost care should be used in seeing that the seal of the treated area of the wood is not broken.

A. J. James (A. T. & S. F.), Chairman; S. L. McClanahan (C. R. I. & P.), J. S. Huntoon (M. C.), F. A. Taylor (B. & O.), H. von Schrenk (I. C.).

DISCUSSION

Hunter McDonald (N. C. & St. L.) described the methods in use on that road to protect the exposed ends of piling cut off below the penetration of the preservative after driving. A strip of galvanized iron 5 in. wide is turned in ½ in. and this edge driven into the cap, the remainder of the strip extending down over the top of the pile and forming a shelter for it. He has covered caps and stringers with galvanized iron with successful results for the last 20 years. At one point where a structure now 20 years old is being rebuilt, 90 per cent of the stringers are fit for reuse. A number of other members referred to increased fire hazard from this form of construction.

C. A. Lichty
Secretary-Treasurer

G. W. Andrews (B. & O.) urged that the need for treated timber be anticipated, so that it can be treated in the exact dimensions desired as far as possible. Where necessary to cut timber in the field, all such surfaces should be painted with hot creosote.

The discussion was closed by the presentation of a moving picture film showing the treatment of timber by the brush, open tank and pressure processes.

THE USE OF ELECTRICITY FOR PUMPING

BY C. R. KNOWLES
Superintendent Water Service, Illinois Central

WHILE electricity has been employed to some extent as power for pumping at railway water stations for many years, its use has not been general. It has long been apparent that electricity had its advantages for this class of service, but up to the past few years current has not been available at many outlying stations and where current was available the rates were often so high that there were but few places where electric power would show a saving in operation over steam or gasoline. Within recent years the production of electricity for commercial purposes has increased greatly and the extension of power lines has made it available at many points on our railroads at rates sufficiently attractive to warrant serious consideration, with the result that there has developed a considerable use of electric motor drive for pumping plants at water stations.

A motor-driven pumping plant with automatic pressure regulator or float switch control is specially suited to locomotive water tank service at many points because the tank may be kept full, regardless of variations in the demand for water, without any attention other than a periodical inspection of motor control and pump.

The cost of electric power for pumping is usually lower than the cost of the fuel that would be required by a steam plant, as the coal consumed at the average railway water station is from four to six times that necessary to generate the electricity required to pump the same amount of water. This is accounted for by the fact that with a steam plant there is a loss of fuel in getting up steam, banking fires, etc. Also as a general thing the pump in the average railway water station is not as efficient a machine as the large steam turbines commonly used in central power stations. Electric motor-driven pumps have an added advantage over steam in lower first cost and lower maintenance, while they are more compact, cleaner and easier controlled. An important factor in the comparative cost of a steam and electric plant is the housing. An electric pumping plant will require a building approximately one-third the size of that required for a steam plant of the same capacity. On the other hand, the difference in the cost of pumping by steam and by electricity is offset to some extent by reason of the current having to be carried over a transmission line, with resultant line losses, together with the cost of construction and maintenance of power lines. Electric power also has a disadvantage where piles and pumps are exposed to freezing temperatures, since it is necessary to provide some means of heating the plant, and where extremely low temperatures prevail constant attendance is often required to keep it from freezing during the winter months. Another point to be considered is the question of electric service interruptions due to storms or other causes. While the motor itself is reliable and can be further protected against failure by installing duplicate units, it is not a prime mover, and unless more than one source of power is provided it is liable to failure through interruption of power supply. This is particularly true where the source of power supply is from a small or heavily loaded plant.

The development of the internal combustion engine using oil as fuel has been a factor in retarding the general use of electricity, as an electric motor can compete with the oil engine in operating costs only where the motor can be operated by automatic control, thereby eliminating the expense for constant attendance. The cost of current is usually based upon the nature of the demand as well as the amount of current used. A better rate may be secured where the load is uniform throughout the 24 hours than where the pumps are operated for only a few hours, and in many cases a still better rate for current may be obtained when the pumping hours are arranged so that the pumps may be operated on the off peak load. Contracts for electric power usually contain a charge dependent upon the aggregate horsepower of the motors as well as the stipulated charge for current. The charges for current are invariably based on a sliding scale of rates per kw., the lowest rate applying to the greatest consumption of power. Rates for current vary widely, depending on the size of the

central power station as well as the location and class of equipment in the power station. Electric drive is adapted to all types of power pumps, especially the centrifugal type, as the motor can be connected direct to a centrifugal pump without belts or reduction gears.

The convenience and simplicity of a direct-connected motor and centrifugal pump make it one of the most desirable installations for tank service under conditions within the limits of centrifugal pump operation. Recent installations have consisted largely of this type of pumping unit, but failure to realize the limits of a centrifugal pump has unfortunately resulted in some unsatisfactory installations.

One middle western railroad has recently installed electric pumping equipment consisting of duplicate units, each having a capacity of 30,000 gal, per hour, the operation of the pumps being controlled by the height of water in the tanks. This plant replaced a steam plant which required the services of three men, while the electric plant is operated by one. The cost for current about equals the cost of coal formerly used in the operation of the steam plant and the net saving is approximately $1,500 per year.

Until recent years it was difficult to secure large quantities of water from wells without using an air lift, which did not always offer the most economical solution of the problem. The development of the deep well turbine pump seems to have solved this problem to a large extent. The deep well turbine or centrifugal pump is particularly adapted to motor drive and installations of this type have proved very satisfactory:

While, under suitable conditions, electric drive has proved very satisfactory in railway water service, at the same time it would be a mistake to fall into the error of considering it for every installation regardless of its suitability for the conditions of operation, as there are many conditions where steam is preferable to electricity on account of the possibility of utilizing the exhaust steam for heating or other purposes, as well as for pumping. The power cost for pumping with oil engines is almost invariably lower than for electric power. As a result the chief advantage that electricity possesses over an oil engine is the possibility of automatic or remote control with a resultant saving in the salary of attendants.

DISCUSSION

A number of members present asked the speaker about the relative cost of power and also about the limits for centrifugal pump operation, to which reply was made that each installation must be designed to meet the particular conditions existing at that point.

REPORT ON THE REPAIR AND MAINTENANCE OF TANK HOOPS

REPORTS collected by the committee from over 45 railways of the United States and Canada, including many of the large systems, showed that many of these lines have greatly reduced the cost of maintenance and eliminated much work and many hazardous conditions by the use of round or half round hoops. Many lines are, however, still using flat hoops and some of the lines which have adopted the round or half round hoops still have some flat hoops in service. A serious objection to flat hoops is the fact that a satisfactory inspection cannot be made without removing them from the tank, due to the fact that they often rust or corrode on the inside and become very thin and weak without any apparent deterioration from the outside.

Regardless of these facts, few roads seem to have uniform or standard instructions for the inspection of tank hoops, especially flat ones, and the hoops are seldom removed unless they show some indication of weakness on the outside surface when the tanks are painted.

W. F. Strouse
First Vice-President

C. R. Knowles
Second Vice-President

Arthur Ridgway
Third Vice-President

J. S. Robinson
Fourth Vice-President

Only two lines were found to have specific instructions for the removal of flat hoops for inspection. These instructions require the removal of all hoops every year in one case and every two years in the other case, at which time all hoops are scraped and painted and all necessary repairs or replacements taken care of. A great variation in the intervals at which tanks and tank hoops are painted is found on various lines, ranging from every two years to every eight years, while many roads report that tanks and tank hoops are painted when needed. There are several good reasons for this variation, among which are the climatic conditions, financial considerations, etc.

Almost without exception it is the practice when erecting tanks to apply at least two coats of paint to both the inside and outside of hoops, usually using red lead for the first coat, the hoops being cleaned well before painting. Paint made of lampblack, asphaltum, varnish, linseed oil, turpentine and Japan drier has been found very satisfactory. The connections, lugs, etc., should be well oiled or painted as often as necessary.

The size and number of hoops has been well determined by design and experience, flat hoops ranging from $\frac{3}{16}$ in. to $\frac{1}{4}$ in. in thickness and from $2\frac{1}{2}$ in. to 6 in. in width, depending on the size of the tanks, and round and

Group of the Bridge and Building Men and Their Families

half round hoops varying from ⅞ to 2½ in. in diameter.

Of the 45 lines reporting on this subject, 25 have practically adopted the use of round or half round hoops and report, as previously stated, that they are far superior, the advantage being that a more satisfactory and thorough inspection or examination can be made of the hoops. Much less surface is exposed to the weather and other injurious elements; they can be drawn up more readily; they are provided with more convenient and substantial connections, and from experience have been found to last longer. In fact, it is stated that they will last as long as the tank under any conditions.

The use of chafing irons between the hoops and tank staves at the connections has been found of great benefit. They are usually made of the same dimension material as the hoops and from 28 in. to 40 in. in length.

The most convenient method, when tanks are to be painted but hoops not removed, is to swing the scaffolding from the pinnacle of the tank over the edge of the roof, rigged so it can be raised and lowered from the scaffolding. When hoops are removed, however, it is necessary to stage around the tank from the ground. On some roads in the warmer climates tanks have no roofs, therefore, there is no pinnacle. Scaffolding, however, can be swung from the top of the staves. On some lines in cold climates where tanks are housed in to protect them from the frost, permanent staging can be maintained between the housing and tanks.

The placing of putty all around between the top edge of the hoop and the side of the tank before tightening and also filling the space between the bolts and the lugs at the connection of the hoop parts has given good results, especially under bad conditions. In many cases this practice has been found practically to eliminate the rusting of hoops on the inside.

The repair of tank hoops is taken care of effectively, generally, by replacing the hoops or parts of the hoops with new or good second-hand ones. When the entire set of hoops has deteriorated to a point where they still have a fair margin of safe life left, the element of chance may be eliminated by placing additional hoops. When hoops or parts of hoops are replaced, the hoops removed can be taken to the shop and in many cases repaired, thus providing repair parts.

F. A. Benz (B. R. & P.), E. C. Zinsmeister (B. & O.), C. W. Wright (L. I.), G. W. Welker (Sou.), J. H. Grover (A. T. & S. F.), A. W. Smith (C. N.), J. L. Winter (S. A. L.).

DISCUSSION

The discussion of the report centered about the relative merits of flat and round hoops. G. W. Andrews (B. & O.) advocated the use of flat hoops, citing his favorable experience with them for periods as long as 28 years. He opposed round hoops on the ground that they cut into the timber when drawn tight, promoting decay. The standard instructions on his road require all hoops to be taken off every time the tank is painted, defective ones then being renewed, while the good ones are painted. Where this has been done no tank has collapsed nor has there been any serious breakage of hoops.

C. R. Knowles (I. C.) stated that he had formerly been an advocate of flat hoops, but on making an extended investigation of this subject four or five years ago he had come to the conclusion that round hoops are better. He has found no evidence of crushing or decay of the timber promoted by round hoops. He also called attention to the fact that the standard tank of the American Railway Engineering Association is equipped with round hoops.

REPORT ON SPRAY PAINTING

PAINTING by spraying, with air pressure, has not come into general practice principally for the reason that considerable equipment and skilled operators are necessary for successful work. In most instances there is some waste of paint, by spraying, ranging from zero up to 10 per cent or perhaps even more, while most users claim a saving of 50 to 75 per cent in labor by the aid of the apparatus. With labor commanding the prices of today it seems advisable to go to the limit in testing the method to find if it is not practical and economical to have one or more outfits on each road with a capable, experienced man in charge. There is no doubt but that the most satisfactory and economical results are obtained where a good quality of paint of the proper consistency is used in connection with the best apparatus in the hands of a skilled operator.

The Kansas City Southern used the spray for painting bridges, the interior and exterior of depots and many other buildings, excepting train work. While the Boston & Albany has used the spray painting apparatus only about six months on bridge work, it is thought that there are no limitations to the practical uses of the method. The bridge and building department of the Baltimore & Ohio has used the paint spray for about 20 years on bridges, buildings, fences and freight cars.

The Michigan Central has not used spraying machines for painting bridges and buildings, but it has used them for 3 years in painting freight equipment, passenger car underframes and trucks, locomotives below the running boards, and other miscellaneous work in and about car shops. The Delaware, Lackawanna & Western has used the spray in the car departmment for 25 years, but does not use it for painting bridges and buildings. In the opinion of this road, the use of the spray machine for painting should be confined to flat surfaces easily reached, such as freight cars, trucks, locomotives, etc., and other more or less unimportant work. The Southern Railway has been using portable outfits for various kinds of work

After the Barbecue at Stone Mountain

with air pressure of 60 to 80 lb., working from ladders, staging or scaffolding, with piping and hose for bridge work, and hose only for building work.

The Long Island uses a sprayer of its own manufacture in applying paint successfully on buildings with large unbroken areas. The Erie developed a home-made apparatus about 14 years ago for painting cars and some large buildings, such as stations, docks and warehouses, but its use was discontinued.

The Southern Pacific uses the spray for applying paint to bridges and buildings as well as to freight cars and other equipment and finds that in the hands of an experienced operator it can be used for all purposes except on trim work with very satisfactory results. The Nashville, Chattanooga & St. Louis has used the paint spray for 12 to 15 years on freight cars, underframes, castings and shed buildings, but uses it very little, if any, for bridge and building work.

Appendix B

By James R. Shean, Los Angeles, Calif.

Nearly all of the present day spraying outfits are composed of three units: (1) the compressing outfit, consisting of an electric motor or gas engine, air compressor and air reservoir, generally mounted on some form of portable truck; (2) the paint container, which may be had in different sizes, and which has pressure regulators, check valve, etc., attached to it; (3) the spray head and hose.

As a rule the gas engine is more practical than the electric motor, as it is not always possible to get suitable current for the motor. Care should be taken that the engine or motor has the right capacity for compressing the required quantity of air to insure a steady pressure. The paint container should be large enough to hold sufficient material to cover a good-sized surface without refilling and the weight of the container when filled should be given some consideration. The air hose should be of rubber and the material hose of some composition material which will withstand the action of the oils and other materials. They should be as light as possible. The spray head itself is the keynote of any spraying outfit. Nearly all paint materials, especially water colors, are more or less gritty and cause a certain amount of abrasive wear on valves. The most satisfactory heads carry the material through a separate channel and force it out in front of the stream of air at the nozzle. About 80 lb. is the average air pressure required for work up to 30 ft. in height.

The one predominating feature of this method of paint application is speed. An experienced operator using the ordinary staging can cover 5,000 sq. ft. in an 8-hr. day. Tests made in Washington under actual working conditions showed that spraying used approximately 10 per cent more material than brushing, but brushing required nearly 200 per cent more labor than spraying.

In applying the paint, the head should be held a certain distance from the surface, generally about 12 or 15 in., and moved in straight stretches across the work, either horizontally or vertically, just fast enough to cover the work thoroughly, without runs or sags. Each stretch should overlap the last one a little, as naturally the paint stream is bound to be a little thinner at the edges than in the center. It has been figured that about 80 per cent of the painting can be done by spraying; the other 20 per cent will probably always have to be brushed on.

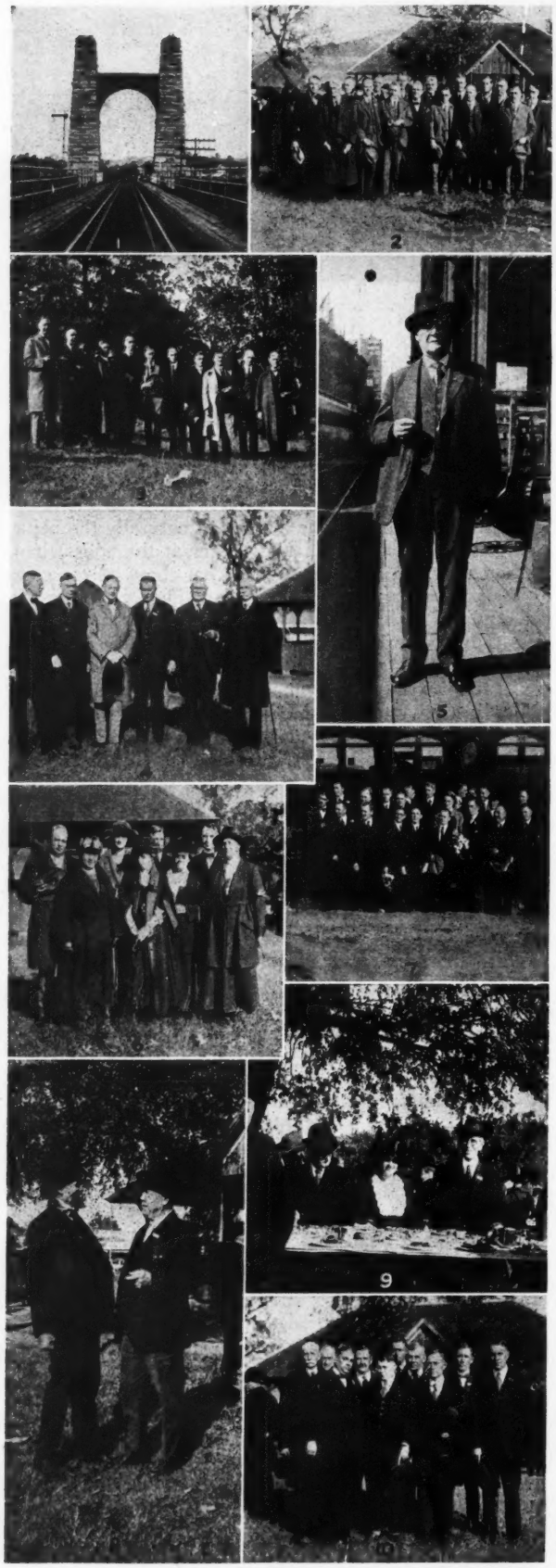
In railroad work, coal chutes, roofs of buildings, board fences, section houses, interiors of engine houses, shops, etc., can be sprayed at an immense saving of labor. Plate girder bridges can also be sprayed, but truss bridges, where there are so many rods and other small surfaces, can probably be painted as cheaply with brushes. On steel work, especially new steel, it is a question whether or not a coat sprayed on will give the same protection that a coat brushed on well. It seems that spraying will have a tendency to bridge the pores of the steel instead of filling them, which is so essential for the proper protection of metal.

Discussion

This report brought out valuable discussion, the consensus of opinion being that the admitted wastage of paint was more than offset by the reduction in labor costs. G. W. Andrews (B. & O.) stated that this method may be used economically on chords, I-beams and many other members of trusses as well as on plate girder and I-beam bridges. He also uses it for the painting of freight houses and other buildings with few openings and on metal roofs. In one instance a large fence was painted with a spray machine recently at a cost of 20 per cent of that by hand. The importance of reducing the labor cost was shown by a recent analysis of the expense of painting a bridge over the Susquehanna river north of Baltimore, in which the labor cost four times the material. J. S. Robinson advocated the application of two coats with the spray.

REPORT ON THE MAINTENANCE OF TIMBER DOCKS

FREQUENT inspections should be made in order to obtain the longest use of the timber without permitting the structures to become unsafe for use. The men who make the inspections should be men of wide experience and sound judgment, for upon their decisions rests the responsibility for the expenditure of large sums of money. The difference between safely-deferred repairs and immediate repairs will be the difference between a reasonable return on the capital represented by the value



Members and Their Friends During the Course of the Convention

of the structure and no return at all. On the other hand, it may be a matter of economy to overhaul the dock at regular intervals and put it in condition at such times to last the period before the next regular time for repairs. It would seem to be the part of good practice, on docks which are in constant operation, to endeavor to obtain all the life possible from all parts of the dock by close inspection and the employment of small crews continuously. No fixed rule can be made, however, and the owners of the railroads must look to the men who have the responsibility of ordering repairs, to obtain the full life of the timber as nearly as possible.

TIME OF REPAIRING DOCKS

The time for repairing a dock is more or less dependent upon the character of the business which is handled over it, and the part of the country in which the dock is situated. Maintenance of docks which are in continuous operation is ordinarily more difficult and more expensive than of docks which are in seasonal operation only. In the first case, the dock must be kept in such condition as not to interrupt the regularity of its operation unduly, resulting in delays in the work of repairing it and often requiring the shifting of repair crews, while in the latter case, docks which are of seasonal use can be abandoned entirely to repair crews and the work handled without interruption. There can, however, be no set time, as each class of dock is a problem by itself and the time for repairing it calls for the exercise of rare good judgment by the maintenance officers in charge, taking account of the labor and material situation, as well as traffic and other matters affected by it. It can be stated, though, that, other conditions being equal, summer work will be found to be less expensive than winter work.

TIMBER FOR REPAIRS

Consideration should always be given to the use of timber for repairs which grows contiguous to the railroad; even though the timber may not have the lasting qualities of that used in the original construction; provided it will last the remaining life of the dock. It should be the aim, so far as possible, in making repairs, to maintain all parts of the structure so that they will approach the state of obsolescence together. This can often be accomplished by taking material replaced at points subjected to very hard wear and using it in other places where the service is not so severe.

It is well to maintain sizable stocks of timber taken from dismantled structures for use in repair work of like structures. All decayed ends of such timber should be cut off and the sound timber piled neatly according to sizes. It is very convenient to have the lengths of the timber marked on the ends of the pieces so that the required lengths can be picked out readily.

EQUIPMENT

On docks of any considerable size, some equipment is necessary to make emergency repairs. Depending upon the character and extent of the dock, this equipment may consist of cranes, derricks, pile drivers, etc., mounted on trucks or skids for land work and on scows for work around the water fronts of the dock. Floating drivers and derricks should be equipped with pumps, hose and jet for use in driving and pulling piles. A good arrangement is to use a long scow, with pile driving leads on one end and a stiff-leg derrick on the other end, both operating from a hoisting engine placed at the center of the scow on a reversible platform or circular track, so that the engine can be faced in either direction to operate either the pile driver or the derrick, as the case may be. A swinging engine may be placed upon the derrick end

of the scow to be used in swinging the derrick boom. Such a scow should be about 32 ft. by 100 ft. in size and 5 or 6 ft. in depth.

Following the general report of the committee, special reports were presented as follows:

1. Maintenance of Timber Ore Docks—Great Lakes. By R. C. Young, chief engineer, L. S. & I., and L. J. Anderson, supervisor of bridges and buildings, C. & N. W.
2. Maintenance of Timber Coal Docks—Great Lakes. By F. N. Graham, assistant engineer, D. M. & N.
3. Maintenance of Timber Docks—Pacific Coast. By H. A. Gerst, assistant bridge engineer, G. N., and T. W. Bratten, supervisor of bridges and buildings, S. P.
4. Maintenance of Salt Water Docks—Atlantic Coast. By B. W. Guppy, engineer of structures, B. & M.
5. Maintenance of Timber Merchandise Docks—Great Lakes. By W. J. O'Brien, district carpenter, C. M. & St. P.
6. Maintenance of Timber Docks—Gulf Coast. By A. J. Catchot, supervisor of bridges and buildings, L. & N.

(The report of the committee was signed by the men listed above and F. C. Baluss (D. M. & N.), chairman).

The report was accepted without discussion.

REPORT ON FILLING BRIDGES AND MAINTENANCE DURING FILLING

WHEREVER possible, timber trestles are replaced by earth embankments, because this forms the most efficient roadbed. It is sometimes possible to begin the filling within a year or two after the pile or timber trestle is first built by putting in from 18 to 24 in. of earth in the ravines each year, thereby gradually filling the opening and also serving the further purpose of preserving the piling, which rots at the ground line, by carrying this line a few feet higher up on the pile each year before decay has had time to injure it. When this method can be followed the structure will not be disturbed during the process and no extra precautions need to be taken.

In cases where the filling must be done more rapidly, it is necessary to take precautions to see that the bridge structure is safe at all times for the operation of trains. Before the filling is begun the structure should be gone over carefully and, if necessary, strengthened. As many of the longitudinal members as can be spared should be removed as the work progresses, as they are in the way of filling material. As the filling material is placed, it should be spread uniformly around and under all parts of the structure and compacted as thoroughly and evenly as may be between the trestle bents to avoid crowding them out of line. As this material is spread, the outer edges should be kept higher than the center to prevent the washing of the slopes, and also to aid in the settlement of the filling, but whether this need be done or not will depend largely upon the nature of the filling material. In some cases it may be best to fill the trestle partly and allow several months to elapse for the settlement of this portion before proceeding with the balance.

The best kind of filling material is that which will pack solidly, is not liable to slip or slide and will not wash away easily during heavy rains. If suitable material can be obtained from borrow pits adjacent to the bridge and the topography of the ground permits it, the best method of filling is by team because in this way the accumulation of earth around the trestle bents is comparatively slow, it can be properly distributed to avoid disturbing the bridge structure and the men and horses employed in handling the earth do much to compact it in passing over it.

Annual Meeting Affords Opportunities for Renewed Acquaintance

Usually suitable material must be hauled from a distance and can be handled by dump cars operated on a temporary track, built parallel to the operated track, and the cars may be loaded by steam shovel or drag line and hauled to the bridge by horses or small engines, or the material can be loaded into railway cars by a steam shovel, hauled to the bridge by train and dumped through the bridge structure. In mountain districts it is sometimes possible to fill trestles by the hydraulic or sluicing method, and when this can be done it is very satisfactory and economical. Because the methods employed and the difficulties encountered are largely determined and governed by local conditions, the practices on different railroads were submitted in short monographs by different members of the association.

F. Gable, P. & R., Chairman; J. F. Pinson, C. M. & St. P.; W. B. Harris, M. & O.; W. E. Burns, S. P.; G. A. Manthey, D. S. S. & A.; R. J. Bruce, M. P.; C. E. Smith, A. S. Clopton, M. K. & T., Committee.

REPORT ON RECLAMATION OF BRIDGE, BUILDING AND WATER SUPPLY MATERIALS

MATERIAL which was not worth the trouble of picking up a few years ago has so increased in value that it is very much worth while to spend considerable labor to reclaim it for further use. At first thought this seems to be more of a question for the store department, but the storekeeper must be governed by the needs of the man who uses material. The latter is also the one best qualified to say whether material he is recovering is fit for further use. Again, something depends upon how the material is taken out of the old structure. The results of what some of the different railroads are doing are as follows:

On the Chicago, Milwaukee & St. Paul an effort is made to utilize all timber and lumber taken out of old structures to the best possible advantage. Bridge stringers that are too short for use in standard openings are resawed to sizes that will make sills for hand car, coal and oil houses, etc. This material is given a treatment of carbolineum at the time it is resawed. Bridge ties are also resawed and pieces that are free from defects are used to make spacing blocks. The rippings from the resawing are used to make crates for material that cannot be shipped open. The usable portions of brace plank are cut to lengths in multiples of two feet and are used in highway crossings or sent out to concrete crews for use as runways or platforms on which to unload material. Cedar pile heads are sent to the mill and returned as shingles. Piles that have been pulled because of line changes and that are in good condition are used as foundation piles under masonry. At the company's Milwaukee shops a great deal of second-hand bridge material is worked up for flat car floors, and such as is not good enough for that is converted into coal and grain doors. Second-hand 1-in. lumber is sorted into three grades and all 3-in. by 6-in. lumber is sorted into two grades.

On the Western district of the Great Northern, in the past it has been the practice to save only the larger timbers from bridges, when renewed, such as stringers, long 12 in. by 12 in. timbers, Howe truss timbers, etc., but in the last two years more care is being exercised to recover old timber. The recovered timber is used for bulkheads along streams, cribs for piers, bulkheads for depot platforms, blocking under bents of framed bridges and for temporary repairs to other timber structures which have not yet quite reached a condition requiring complete renewal. All iron is recovered so far as possible and reused in the structure being renewed or a similar structure. Iron recovered but not fit for use again is sent to the stores department as scrap and is there sorted and worked over into castings or other usable forms.

On the Philadelphia & Reading the materials recovered by the bridge department are turned over to the stores department for reclamation. A large number of bridge ties 9 in. by 12 in. by 12 ft. were removed, after having been in service about 18 years. After all spikes were removed the ties were shipped to the saw mill and 5 in. of the top sawed off, leaving a tie 7 in. by 9 in. by 12 ft. in good condition for use on industry trestles and places where the lighter tie will answer. The cost of loading, transporting, sawing and shipping from the mill to the store yard is much less than the cost of new ties and they will last from 7 to 8 years on commercial trestles. Valves, that were considered worn out, are taken out and repaired at the shops.

On the Ann Arbor material, when taken out of bridges, is sorted, and all that can be reused in temporary structures and retaining walls, for posts and caps for freight house platforms or similar work is loaded and shipped to the storekeeper as second class material and placed in stock. Old bolts are either cut up for drift bolts or are sent to the shop to be rethreaded and refitted.

On the Kansas City Southern the engineering department gives close attention to salvaging second-hand material and using it in repair work. When repairing or renewing pile or frame trestles all timber is salvaged that will answer for repairs to trestles, platforms, stock pens, etc. Stringers, caps, ties, posts or piles that are recovered are assembled and shipped to supply yards from which they are issued to repair gangs to replace similar material. Second-hand bridge ties are used for stock pen posts, wing-fence posts, and right-of-way fence gate posts. Hardware recovered from old trestles, such as bolts, washers and spikes, is all used again in the reconstruction of the trestle as far as usable. Guard rail bolts that cannot be reused as such are used in place of boat spike or line spikes. Old chord bolts or sway brace bolts similarly damaged are used for drift bolts. By this plan it is found necessary to purchase very few drift bolts or boat spikes. The same rule is applied to water service material. When renewing wooden tubs, water tanks, etc., all usable material, such as supports, staves and hoops, is salvaged and used for replacing decayed staves or weak hoops and supports on other old tanks of similar construction. All second-hand pipe is recovered and when necessary the ends are cut off and re-threaded. Globe-valve seats are re-ground and the serviceable parts of old valves are used in making repairs. The same plan is followed with pumps. Only such parts are scrapped as cannot be used for repair work.

On the New York, New Haven & Hartford old bridge stringers are sometimes used to replace shorter ones, putting in an extra one where necessary to bring the structure up to the required strength, the poorer ones being used for curbings at outlying stations and filled in with cinders and crushed stone or used for cribbing around back of freight stations, bank walls, etc. Recovered water pipe of 3 in. diam. or over that is not good for high pressure is used for drain pipe, and old, leaky valves are sent to the storekeeper to be repaired.

On the Grand Trunk during the last few years a considerable number of light steel bridges have been taken out of service. These are worked over and used in many ways, particularly for overhead highway bridges. A small shop has been instituted and is constantly engaged on this kind of work.

On the Lehigh Valley lumber taken out of bridges and trestles is sorted, separating the partly good and the good

material from that which is of no further use. It is then sent to the division yard, where the partly good lumber is sawed to separate the good from the poor, producing various sizes of material for use at bridges and buildings, concrete forms, etc. Good bridge ties can be cut from 8-in. by 8-in. and 12-in. by 12-in. second-hand timbers, while old ties will produce various smaller standard sizes of lumber. For larger jobs a portable gasoline engine and circular saw are set up at the various places and the lumber taken out and sawed to sizes suitable in other work. The cost of sorting and sawing second-hand lumber ranges from $6 to $10 per thousand, depending on the quantity of lumber involved. Eye bars from iron bridges are sent to the locomotive shop for general use; I-beams, angles and heavy plates are usually taken in stock for future use; heavy floor beams of double-track bridges are retained for use as longitudinal girders; deck plate girders are doubled up and reused; heavy double track girders are used for single track bridges, and such material as cannot be re-used is disposed of as scrap as it comes from the bridge without cutting it apart. From buildings, such lumber and hardware, brick, roofing, slate, etc., as will be useful in other work, is reclaimed; some of the heavier sizes of lumber, if partly decayed, are sawed to smaller sizes; flooring and siding are generally used for rough concrete forms. Doors, windows and frames, if good, are reclaimed for use on other buildings. In the case of pipe lines, when accessible, the joints are heated with an acetylene torch and the pipe and lead are stored for future use. Wrought pressure pipe which has become defective can often be used for wire conduits, saving the purchase of new conduit pipe.

All of the truss bridges on the New York Central have been renewed in the last few years on account of the heavy power and traffic, and the old light trusses used to replace wooden highway bridges. In the case of girder bridges, where a stronger structure is desired, girders from two tracks are doubled under one track and new girders of proper size placed under the other track. All I-beams that are too light to use in bridge structures are used to replace old rail cover boxes and for grillage under bridges. All bridge ties removed are used in temporary work for falsework where masonry changes are made. A great many old bridge ties are used for cribbing to hold a bank from sliding on the track. The entire amount of frog blocking used on the system is made from old material and not a foot of new material is used. Oak pile butts are resawed into track shims. Old trestle timber is used over as far as possible. Timber that is fair is sent to the mill and resawed into plank and short ends are saved and used for blocking. When an old water column is taken out all parts that can be re-used are properly cared for and put in stock and re-used. Wooden water tanks are made to last as long as possible by reinforcing with extra hoops. When tanks are demolished the hoops that are sound are reclaimed; timbers may be used for temporary work and the staves for various work around buildings and on temporary construction.

At the Baltimore & Ohio shop at Martinsburg, in the rebuilding of bridges, old spans are strengthened for branch lines and highway bridges. The cost of the work has been running approximately 40 per cent of what new bridges would cost after allowing scrap value for the material. Where the old spans are not considered of sufficient value for rebuilding, they are cut up and the web plates and any angles for which further use could be found are saved. Short turntables of 60 ft. and under, instead of being scrapped, have the girders inverted and the necesary floor system installed for highway bridges. Where an 80-ft. or 100-ft. turntable is taken out on account of deterioration, a new or second-hand table is installed and the old table sent to this shop, where it is strengthened and then held in stock for future use. It is found in the reclaiming of this material that a large amount of stock is obtained for use on coal tipple chutes and aprons, slide plates for track work and miscellaneous repairs for steel work on bridges and buildings. At the Zanesville shops attention is given not only to the reclamation of track material, but all motive power materials, and timber that in many cases would be destroyed or sold as firewood. The latter includes short lengths of stringers and bridge material for which use could not be found on the road, old piling, pile heads, etc. This together with old car material sent in to this shop is sawed up for lumber and used for various purposes at a cost approximately 30 per cent of the purchase price of new timber.

The Chicago & North Western has three saw mills, two of which are electrically equipped, while the other is operated by a gasoline engine of 30 hp. Bridge timbers are sawed into all sizes of smaller standard material and the lumber used for small buildings of every description. Cedar pile heads are sawed into shingles. Other pile heads are used for jack handles, car stakes, etc. Not only is the mill a necessity for sawing up second-hand material, but it serves an excellent purpose for resawing odd sizes left over from the construction of engine houses, water tanks and such material as would otherwise have to be held on hand for years unless it was used to disadvantage without being sawed.

G. T. Richards, C. M. & St. P., Chairman; P. Aagaard, I. C.; F. E. Schall, L. V.; J. J. Murphy, S. P.; W. A. Pettis, N. Y. C.; G. W. Andrews, B. & O.; J. J. Wishart, N. Y., N. H. & H.; W. J. Jackson, C. & N. W.

(This report was accepted without discussion.)

REPORT ON STANDARD FORMS FOR BRIDGE INSPECTION

THE PARTICULAR form of operating organization maintained and the personnel thereof was found to have a marked influence on the kind of forms adopted by the various roads. Again, the physical characteristics peculiar to each line governed to some extent the character of the forms used. The consensus of opinion was found to be decidedly in favor of the narrative form of field notes. It was also developed that by all means the inspector should have before him while making the inspection a sketch, diagram, or consist of the structure. To fulfill all the needs and serve as a standard pattern, any series worthy of recommendation must conform to the following principles:

1. Facility in recording notes and saving the man in the field all unnecessary and onerous labor.
2. A diagram, sketch, or caricature of the structure to be inspected.
3. Provision for accurately recording conditions and findings which can be interpreted correctly in a review of the notes by anyone at any time subsequent to the inspection.
4. Clarity of reference in the notes to any particular member so that the thought of the inspector cannot be misconstrued.
5. Utilization of the notes for maintaining correct office records of the consist of structures.
6. Provision for the compiling of field notes in a readily accessible form for subsequent use and future reference in the office.
7. A minimum of labor and expense must be involved in equipping the inspector with a concise and compact

record of the consist of structures and findings of previous inspections.

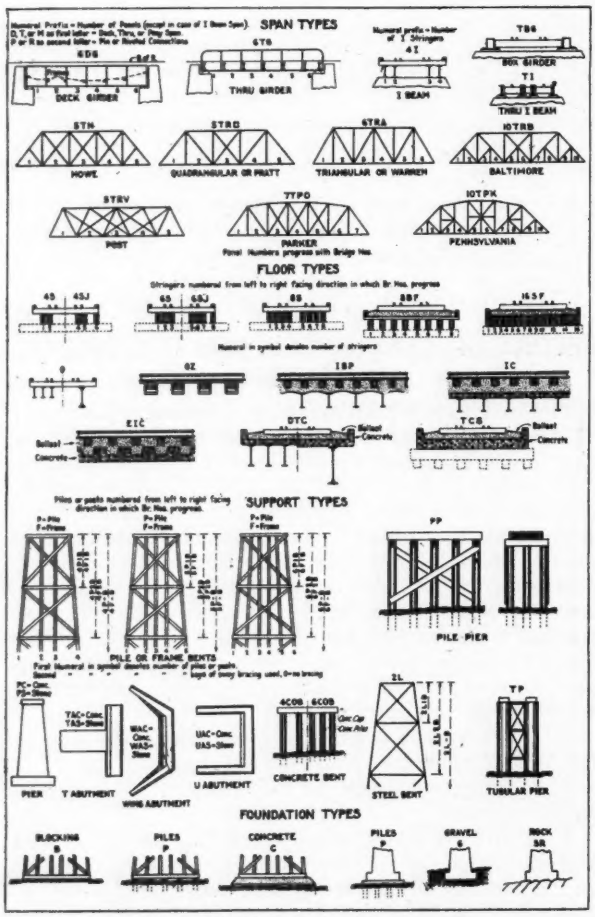
8. The inspection is only the first step in the maintenance of structures, and the inspector's notes form the basis of the entire program of work. Forms, therefore, must facilitate the work of compiling bills of materials, making requisitions, and the issuance of shipping directions without error or confusion.

9. Any common standard proposed must be adaptable to all railroads regardless of mileage or form of operating organization, sufficiently comprehensive to cover all types of structures, and adequately elastic to permit of general or detailed expansion.

10. Simplicity and economy consistent with the end sought dictate that the number of forms be a minimum.

DETAILS OF THE WORK

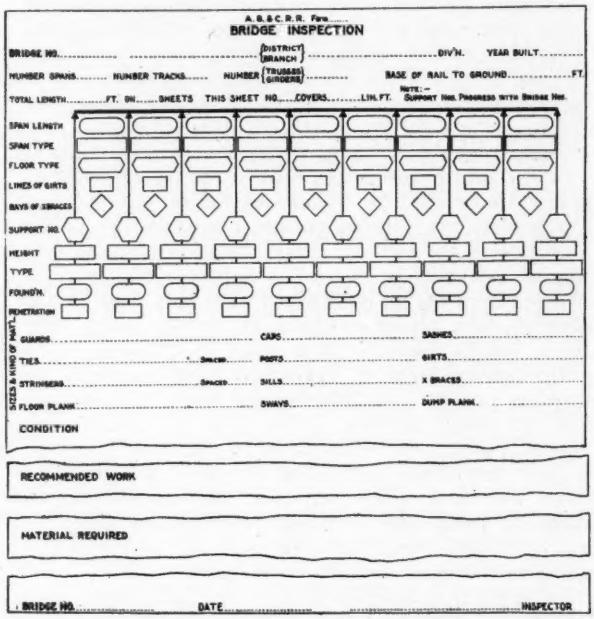
Recourse was had to the method of symbolic reference and forms worked out along this line. The essence of the scheme is order—a place for everything and everything



Form 1001. The Key to the Structure Types

in its place. This can always best be accomplished where so much information of a similar nature is involved by enclosing the space assigned to any particular portion thereof in distinctive outliue. The final result must, of course, be a compendium of the complete office record so arranged as to serve just as well as could a detailed structural plan. The symbols, as finally adopted, consist usually of the initial letter of the word or words by which the structure or kind of construction is customarily described. Therefore, the letters or figures in the symbols used mean something and are not merely letters or figures selected at random. In conformity with this scheme, symbols for types not illustrated can be formed readily.

Form 1001 is the key to structural types and kinds of construction with the symbols to be used in the designation thereof. This should preferably be printed on the in-



Form 1002. For the Inspection of Bridges

side of the front cover of the inspector's book in an inverted position so that when the book is opened it will be erect for instant reference. From 1002 is the central form of the set. On this form, in as many sheets as necessary, should be entered all the required information as to type, consist or makeup of the structure taken from the office records. The transcription of the data from the records to the form should be as complete as possible, not overlooking sizes and dimensions, for it is from this form, after the inspector has recorded his field notes thereon, that estimates and bills of materials are compiled and a working program arranged to carry out the inspector's recommendations without recourse to other sources of information. The form, when returned by the inspector, will serve to correct or verify the office record, and is to be made the basis for concurrently keeping up the history of the structure in all its details.

Form 1003 is for the inspection of those structures such as culverts, cattle guards, and buildings for which Form 1002 is not readily applicable, and the inspector's advance information accompanied by such illustrative sketches as may be necessary should be entered thereon. After the data for any one district or branch have been transcribed from the records to Forms 1002 and 1003, the sheets covering the various structures are to be arranged in geographical order and bound together by removable fasteners.

BRIDGE AND CULVERT RECORD

The maintenance of a concurrently correct office record of bridges and culverts is so interwoven with their periodical inspection that a consideration of the one can scarcely be separated from the other. A study of the inspection forms led to a suggested scheme for office record of bridges, culverts, and other line structures. This

was shown in a card system record of structures, constituting Appendix B of the report.

Arthur Ridgway (D. & R. G.), Chairman; G. E. Boyd (D., L. & W.), W. A. Clark (D. & I. R.), J. T. Harvey (B. & A.), R. H. Helick (P. R. R.), C. W. Lentz (I. C.), M. E. Nelson (A. C. L.), J. J. Taylor (K. C. S.).

DISCUSSION

In presenting the report, Mr. Ridgway emphasized the necessity of each inspector having before him a com-

A. B. & C. R. R. Form.....

BRIDGE INSPECTION

SPECIAL AND MISCELLANEOUS STRUCTURES

CLASS OF STRUCTURE..... NO. OR LOCATION..... (DISTRICT) (BRANCH)..... DIVISION

CHARACTER AND SIZE.....

ILLUSTRATIVE SKETCHES

CONDITION

Form 1003. For Miscellaneous Structures

plete record of each structure as he inspects it in the field, including a copy of the notes of previous inspections. R. H. Reid (N. Y. C.) emphasized the importance of the inspector making complete notes of each structure as he goes over it in the field, rather than leaving details to be added in the office. He pointed out the constantly changing conditions of even so-called permanent structures, the average life of such bridges being not over 25 years.

REPORT ON THE MAINTENANCE AND REPAIR OF FREIGHT HOUSE FLOORS

ONE OF THE prime needs in a modern freight house, especially where much trucking is done, is a smooth floor, and one of the perplexing problems of a building supervisor is to keep this floor smooth at all times. When deciding upon the type of floor that is best suited for any freight house, consideration should be given to the available materials, the nature of the freight to be handled, the amount of trucking that must be done, the climatic and physical conditions, *the ease with which repairs or renewals can be made when needed.*

A yellow pine floor is more widely used than any other type, and considered from the point of first cost only, is the cheapest floor that can be constructed, particularly in a timber country. It can be used to advantage where trucking is not heavy, and in new buildings where deep filling is required inside the foundation where settlement is likely to occur. Long leaf yellow pine is preferable to short leaf and has a probable life of 8 to 12 years, depending upon the character of traffic. Repairs can be made readily to yellow pine floors and when planks are broken or damaged, they can be removed and replaced easily, but after the floor is worn considerably, this results in an uneven floor. It is possible after such a floor is considerably worn to take up the planks and relay them with the bottom side up, using shims to secure an even bearing on the joists.

Hardwood floors of maple, beech and birch have been used extensively for years as a top finish wearing surface upon a sub-floor of yellow pine or other similar wood. Sometimes this type of floor is built on a concrete foundation, in which case the under-floor is nailed to nailing strips embedded in the concrete. It is recommended that the flooring strips or screeds be of creosoted material. Decay develops quickly in double floors subject to dampness and it is thought that a heavy single hardwood floor will outlast a double floor on account of the elimination of such decay. In order to avoid dry rot in double floors on sleepers or concrete foundation it is necessary that no accumulations of dust or rubbish be allowed and the floor should be so constructed as to allow for the circulation of air. Many roads lay the hardwood surface flooring diagonally, and while this causes some waste of material it tends to prolong the wearing life of the floor surface.

Investigation discloses but comparatively little use of floors covered with metal plates in railway freight houses. Where used they are largely runways where the trucking is unusually heavy and good service is reported. If plates are used they should be roughened or corrugated to afford a foothold for the men.

In order to insure a satisfactory wood block floor, a good concrete or other solid and substantial foundation is necessary. This type of floor is resilient, smooth, easy for trucking, readily repaired, dustless, has long life and entails a low maintenance cost. It will not, however, stand exposure to weather, and, as a general rule, repairs leave an uneven surface. Wood block floors are divided into two classes: Untreated and creosoted.

Untreated wood block floors can be used to advantage where delicate merchandise is handled. The blocks should be placed on a ¾ in. or 1 in. sand cushion and the joints filled with 1 to 1 cement mortar or laid on a pitch base and the joints filled with asphalt. The sand or pitch acts as a cushion for the blocks and insures an easy working floor. Care should be taken that this floor is not exposed to the weather, as water may cause it to buckle. Floors of this type are easily repaired by removing worn or damaged blocks and replacing them with new material. However, when such repairs are made it produces a very uneven wearing surface, which, at times, might have a tendency to damage fragile merchandise or packages in trucking.

Creosoted wood block floors are laid similarily to the untreated wood block floors and have practically the same characteristics. The main objection to creosoted wood blocks in freight stations is that the creosote taints certain kinds of merchandise, such as flour, butter, etc. At points where these commodities are not handled, it is considered an ideal floor. Trouble has been caused from time to time by shrinkage and expansion, and it is recommended that in dry locations blocks should be well seasoned, while green or semi-air dried blocks are preferable for damp or moist conditions. Repairs are easily made the same as for untreated wood block floors.

Brick floors do not seem to be desirable floors for freight houses. The general opinion among railroads as to this type or floor seems to bear out the following facts, viz.: it is a strong, durable floor with a low maintenance cost, easily cleaned and sanitary, but it is not adapted to easy trucking, is a hardship on the truckers' legs and feet, and is very noisy. It is brittle, so that it chips and breaks easily, and is unyielding, so that falling packages of delicate or fragile character are often damaged. Brick floors are recommended for storage warehouses or freight houses which are subject to damp conditions and for the storage of oils, paints, greases and other volatile and inflammable materials on account of the fire-resisting qualities of the brick. Brick floors should have a good concrete foundation with a sand cushion. Repairs to brick floors are very easily made by taking out the defective

bricks and replacing them with new ones, care being taken to see that the sand cushion underneath is compact and level and thus make the floor surface as smooth and even as possible. Sometimes it may be found necessary to remove and relay more or less of the surrounding floor in order to insure a good job.

Opinions on asphalt mastic floors showed a great deal of divergence, but in general good service was had under dry, cool conditions. Floors of asphalt or mastic are probably more easily repaired than any other kind. If a hollow place or hole develops it is repaired by removing enough of the top layer until all of the surrounding surface is on a level plane. New asphalt or mastic is then applied and finished as in the original floor. There seems to be no difficulty in securing a good bond in this case because the material is applied in a fluid or semi-fluid state, usually hot.

An asphalt block for freight house floors has only recently come into use and very little data are available regarding it. The blocks are laid like wood blocks, or brick, in a mortar bed on a concrete base. No expansion joints are needed. They form a floor which is noiseless, dustless, waterproof, odorless and sanitary. Repairs are easily made by removing such blocks as may be defective or damaged and replacing with new blocks.

Concrete floors are cheap and fairly permanent, are sanitary, easy to clean and require no special foundation. It is becoming a general practice of late to reinforce concrete floors, but this does not add materially to their life except on filled or new-made ground where it might afford some advantages. A concrete floor, as a rule, is dusty, noisy, hard on truckers' legs and feet, is easily damaged by falling packages and merchandise, becomes worn in spots, which eventually develop into large holes and uneven surfaces, is subject to surface cracks due to temperature changes, and breaks up under the impact of truck wheels. For these reasons the maintenance cost is high and this type of floor does not compare favorably with other floors. Great care should be exercised in laying concrete floors so as to overcome the above disadvantages and difficulties as much as possible. The reinforcement of the top of a concrete floor with triangular mesh will tend to prevent cracks, and thus prolong the life of the wearing surface. Temperature cracks cannot be altogether avoided, but when they first occur, as they will in cold weather, they should be filled up with a heavy composition similar to what is now being used on concrete highways. It has been found that the wearing qualities of a concrete floor depend principally on the coarse aggregate used and on the method of working and mixing the materials. It seems to be generally accepted that an excess of water in mixing is the principal cause of dusting. Excessive troweling in finishing is also inadvisable.

When a concrete floor develops holes, repairs may be made in one of two ways. It may be patched by first cutting away and removing all of the loose or poor concrete until the edges and bottom of the hole are of good, sound concrete and this hole filled with new concrete. This method, however, usually turns out to be only temporary, because it seems almost impossible to get a good bond between the new and the old concrete and another hole will soon develop. The old concrete seems to have absorbed sufficient foreign matter or dirt of a more or less greasy nature to prevent a good bond. The better way is to take out the entire square or slab of concrete and replace with new material.

J. P. Gallagher (N. Y. C.), chairman; D. Rounseville (C. & N. W.), A. T. Hawk (C. R. I. & P.), C. P. Rawson (C., M. & St. P.), T. D. McMahon (G. N.), C. J. Scribner (C., B. & Q.), D. L. McKee (P. & L. E.), S. C. Tanner (B. & O.), F. H. Soothill (I. C.).

OTHER FEATURES

ON TUESDAY evening, Maro Johnson, assistant engineer, Illinois Central, described the erection of the St. Charles Air Line bridge, Chicago, a very long span, single-leaf bascule structure. His talk was illustrated with slides and moving pictures. Hunter McDonald, chief engineer of the Nashville, Chattanooga & St. Louis presented an instructive paper describing the methods employed by that road in housing and feeding maintenance of way employees, illustrating his remarks by means of lantern slides. He described the methods for determining, proportioning, distributing and accounting for the food as rationed out to the employees. Housing plans were shown, including such arrangements as firemen's houses, laborers' houses, camps and camp cars, etc. This paper will be presented in a succeeding issue of the *Railway Maintenance Engineer*. J. K. Melton, official photographer of the Illinois Central, presented moving pictures of bridges and bridge work. This included pictures of the construction and operation of the St. Charles Air Line bridge and of the operation of other large structures on the Illinois Central and other western and southern roads.

Col. H. C. Boyden of the Portland Cement Association, Chicago, presented a paper before the association on Wednesday morning on the Proper Proportioning of Concrete Mixtures. This paper was published in the September issue of the *Railway Maintenance Engineer*, page 334.

The annual dinner of the Bridge and Building Association and the Bridge and Building Supply Men's Association was held at the Capitol City Club on Wednesday evening with approximately 300 present. On the afternoon of that day the members of the Bridge and Building Association visited the shops of the Nashville, Chattanooga & St. Louis near Atlanta and later made an inspection of that road's bridges over the Chattahoochee river, going by special train. Following adjournment, the members attended a barbecue at Stone Mountain on Thursday afternoon, for which the Georgia Railroad furnished a special train.

CLOSING BUSINESS

At the business session on Thursday morning the following officers were elected for the ensuing year: President, W. F. Strouse, chief engineer, Public Service Commission of Maryland, Baltimore, Md.; first vice-president, C. R. Knowles, superintendent of water service, Illinois Central, Chicago; second vice-president, J. S. Robinson, division engineer, Chicago & North Western, Chicago; third vice-president, Arthur Ridgway, assistant chief engineer, Denver & Rio Grande, Denver, Colo.; fourth vice-president, J. P. Wood, supervisor of bridges and buildings, Pere Marquette, Saginaw, Mich.; secretary-treasurer, C. A. Lichty, purchasing department, Chicago & North Western, Chicago; members of the executive committee for one year, A. B. McVay, supervisor of bridges and buildings, Louisville & Nashville, Evansville, Ind.; J. H. Johnston, superintendent of bridges and buildings, Grand Trunk, Montreal, Que.; E. T. Howson, editor, *Railway Maintenance Engineer*, Chicago; members of the executive committee for two years, C. W. Wright, master carpenter, Long Island, Jamaica, N. Y.; G. A. Manthey, superintendent of bridges and buildings, Duluth, South Shore & Atlantic, Marquette, Mich.; E. K. Barrett, supervisor of bridges and buildings, Florida East Coast, St. Augustice, Fla.

New York City will be the place of next meeting.

The subjects selected for consideration by committees during the ensuing year are as follows: (1) Tool equip-

ment for pile driver outfits; (2) the recruiting of bridge and building employees; (3) the effect of the eight-hour day; (4) the detection and repair of leaks in water mains; (5) the cleaning of structural steel before painting; (6) the construction and maintenance of cinder pits of various types; (7) the lining of tunnels under traffic; and (8) the construction and maintenance of passenger platforms.

SUPPLY MEN'S EXHIBIT

THE BRIDGE and Building Supply Men's Association presented an exhibit in rooms adjoining the convention hall. Forty firms were represented, their exhibits consisting largely of photographs, literature and models of their products.

The officers of the Supply Men's Association for the past year were as follows:

President, Tom Lehon, The Lehon Company, Chicago; vice-president, C. E. Ward, U. S. Wind Engine & Pump Co., Batavia, Ill.; treasurer, M. J. Trees, Chicago Bridge & Iron Works, Chicago; secretary, G. R. McVay, The Barrett Company, Chicago; honorary director, P. C. Jacobs, H. W. Johns-Manville Co., Chicago; members of the executive committee: E. T. Howson, *Railway Maintenance Engineer,* Chicago; G. W. Lindholm, Patterson Sargent Co., Cleveland, Ohio; W. O. Washburn, American Hoist & Derrick Co., St. Paul, Minn.; A. J. Filkins, Paul Dickinson Co., Inc., Chicago; D. J. Higgins, American Valve & Meter Co., Chicago; F. M. Condit, Fairbanks Morse & Co., Chicago.

The companies exhibiting, with the nature of their displays and the names of their representatives, are as follows:

American Hoist & Derrick Company, St. Paul, Minn., literature; W. O. Washburn, F. J. Johnson, J. L. Prator and R. R. Nixon.

American Tar Products Company, Chicago; P. J. Griffiths and S. H. Fields.

American Valve & Meter Company, Cincinnati, Ohio; models of non-freezable drop spout and water column; J. T. McGarry and D. J. Higgins.

Asphalt Block Pavement Company, Toledo, Ohio; samples of asphalt paving; E. J. Snyder.

Barrett Company, New York; samples of shingles and roofing, literature; G. R. McVay and W. E. May.

Buda Company, Chicago; literature; P. W. Wood.

Carter Bloxonend Flooring Company, Chicago; sample blocks and photographs; R. G. Stowell.

Chicago Bridge & Iron Works, Chicago; literature; M. J. Trees and J. L. Zeller.

Detroit Graphite Company, Chicago; samples of enamel paints and literature; L. D. Mitchell, A. B. Edge, W. D. Waugh, J. R. C. Hintz and J. F. Neiman.

Paul Dickinson Company, Chicago; ventilators; Arthur J. Filkins and D. B. Wright.

Dixon (Joseph) Crucible Company, Jersey City, N. J.; model of painted station; H. A. Nealley and J. H. Lewis.

Duff Manufacturing Company, Pittsburgh, Pa.; jacks; G. E. Watts and W. T. Willingham.

Fairbanks, Morse & Co., Chicago; literature; F. M. Condit, H. E. Vogel, B. S. Spaulding, A. A. Taylor, M. J. Kockendorfer, F. L. Daggett, C. T. Fugitt, J. M. Barran, J. T. Frame and D. K. Lee.

High Grade Manufacturing Company, Cleveland, Ohio; roofing, cement; S. A. Baber.

Johns-Manville Company, H. W., New York City; literature; H. G. Newman, W. H. Lawrence.

Kaustine Company, Buffalo, N. Y.; literature; D. A. Evans and J. H. Fotheringham.

Kelly Derby Company, Chicago; C. F. Smale.

Lehon Company, The, Chicago; mule-hide roofing and shingles; Tom Lehon and J. E. Eipper.

Massey Concrete Products Company, Chicago; J. A. Higgs, Jr.

M. & S. Company, Chicago; yard and stock-pen hydrants; L. W. Millar.

National Water Main Cleaning Company, New York; literature; Burt B. Hodgman.

Nelson (Jos. E.) & Sons, Chicago; photograps; J. E. Nelson and W. H. Nelson.

Nichols (Geo. P.) & Brothers, Chicago; literature; George P. Nichols and S. E. Nichols.

Norton, A. O., Inc.; Boston, Mass.; self-lowering jacks; G. R. Law and W. R. Kelly.

Patterson & Sargent Co., Cleveland, Ohio; pocket list of railway officials, New York City.

Raymond Concrete Pile Company, New York; pile shell for concrete piles; H. D. Oliver.

Simmons-Boardman Publishing Company, New York; copies of *Railway Maintenance Engineer and* Railway Age; E. T. Howson, Milburn Moore, and B. J. Wilson.

Railway Review, Chicago; W. M. Camp.

Refinite Company, Omaha, Nebr.; literature; P. L. Markel.

Robertson & Co., William, Chicago; model of culvert and photographs; R. F. Repasz.

Sherwin-Williams Company, Cleveland, Ohio.

Standard Asphalt & Refining Co., Chicago; samples of primers, Sarco No. 6, waterproofing materials and emarex; G. A. Thornton.

T. W. Snow Construction Company, Chicago; literature; T. W. Snow.

Texas Company, The, New York; roofing and roof paint; J. F. Ryan and F. K. Dorrance.

U. S. Wind Engine & Pump Company, Batavia, Ill.; literature; C. E. Ward.

Virginia Bridge & Iron Company; Roanoke, Va.; J. W. Leroux.

Volkhardt Company, Inc., Stapleton, N. Y.; W. Volkhardt.

Vulcanite Company, The, Chicago.

White Company, L. & I. J.; adzes; C. H. Broward and C. S. Broward.

At the annual election on Thursday morning the following officers were elected for the ensuing year: President, C. E. Ward, U. S. Wind Engine & Pump Company, Batavia, Ill.; vice-president, M. J. Trees, Chicago Bridge & Iron Works, Chicago; treasurer, G. R. McVay, The Barrett Company, Chicago; secretary, A. J. Filkins, Paul Dickinson Company, Inc., Chicago; honorary director, Tom Lehon, The Lehon Company, Chicago; members of the executive committee: W. O. Washburn, American Hoist & Derrick Company, St. Paul, Minn.; C. W. Kelly, The Kelly Derby Company, Chicago; D. J. Higgins, American Valve & Meter Company, Chicago; F. M. Condit, Fairbanks-Morse Company, Chicago; T. W. Snow, The T. W. Snow Construction Company, Chicago, and W. H. Lawrence, The H. W. Johns-Manville Company, New York City.

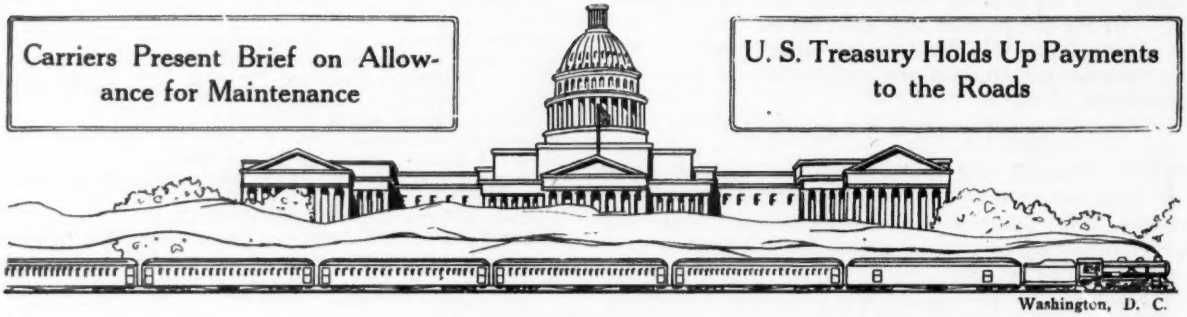
PENNSYLVANIA TRACK INSPECTION

AS A RESULT OF the annual track inspection on the main line of the Eastern region, the Pennsylvania system, C. S. Frick, general manager, has awarded track maintenance prizes to the supervisors and their assistants. The first or "Klondyke" prize, amounting to $800 for the supervisor and $400 for the assistant, awarded for maintaining the best section of track throughout the past year, was presented to H. H. Kauffman, supervisor, and J. B. Otto, Jr., assistant supervisor, in charge of the track between Dillerville, Pa., and Harrisburg.

The other prizes were three premiums of $800 each, of which $600 was for the supervisor and $200 for the assistant, for the best line and surface on a Main Line Superintendent's Division between New York and Washington, and Philadelphia and Altoona. They were awarded to: L. J. Fairbank, supervisor, and C. W. Van Nort, assistant supervisor, in charge of track between Elizabeth, N. J., and Plainsboro; C. S. Hager, supervisor, and F. T. Fish, assistant supervisor, in charge of track between Marysville, Pa., and Durward, and R. W. E. Bowler, supervisor, and E. R. Parke, assistant supervisor, in charge of track between Baltimore and Washington.

A special "Improvement" premium of $1,000, of which $700 goes to the supervisor and $300 to the assistant, was awarded to E. L. Koch, supervisor, and E. L. Smith, assistant supervisor, who have charge of the track from Sixty-second street, Philadelphia, to Wilmington.

RAILWAY AFFAIRS AT THE NATION'S CAPITAL



Washington, D. C.

ALFRED P. THOM, S. T. Bledsoe and J. P. Blair, as a committee of counsel for the Association of Railway Executives, have filed a brief with the Interstate Commerce Commission on the allowance for maintenance during the guaranty period. This is in reply to the brief of the Director General of Railroads on the interpretation and application of the paragraph of section 209 of the Transportation Act. The brief of the director general took the position that the director general's obligation during federal control, which, under the act, is made the basis for the allowance to be made for maintenance during the guaranty period, should be based on the expenditure of money, while the executives contend that wherever possible it should be measured on a basis of physical reparation. Following are some extracts from the reply brief:

EXTRACTS FROM CARRIERS' BRIEF

The government contends that the contract as written calls for a mere "money test," and requires only a comparison of the aggregate amount of money expended in the two periods as shown by the books—that the contract does not contemplate a comparison of the amounts of physical reparation except that, as the government contends, the parties have agreed that, for the purpose of adjusting their accounts, the comparison of physical reparation is sufficiently reflected in the amount of money expended without reference to actual physical reparation.

In other words, the director general contends that, under the terms of the contract, all question of the condition of the property at the time it is returned has been waived by the carriers, and that the government has no responsibility whatever for this condition beyond spending an agreed sum of money.

Certainly, unless the language used in the contract is susceptible of no other construction, it cannot be successfully contended that the contract must be construed to disregard the physical condition of the property during and at the end of federal control, in view of the fact that both the President and Congress adopted the physical test and gave assurance to the carriers that physical condition should not only be considered, but that the condition of the property should be as good when the property was returned as when it was taken over.

On page 17 of the director general's brief the contention is made that the "cost" of a thing is synonymous with the "price." This manifestly is true only if the thing is the same. In this case, price has reference to hourly or daily wage; cost has reference to the labor job. The price of labor by the day or by the hour is, of course, not synonymous with the cost of labor to do a certain amount of physical reparation.

If, in order to satisfy the covenant of the government, it became necessary during federal control to put into the property 100 tons of steel rails because in the period with which comparison is required 100 tons of steel rails had been put into the property, the cost of labor to do that job would in no sense be synonymous with the price of labor by the day or by the hour; and yet if the physical reparation is required to be made in accordance with the assurance of the President, with the requirement of the act of Congress and of justice to the owners, it is entitled to have that quantity of 100 tons of steel rails not only bought but put into the property, and is entitled to have the cost of doing this piece of physical reparation paid by the government. If it cost the government less in labor than it had cost the carrier, the government is, under the contract, entitled to the saving; if more, it must pay the excess.

The cost of doing the maintenance involved in putting into the property this item of 100 tons of steel rails to correspond with 100 tons of steel rails put in during the test period, would be made up of the cost of the rails plus the cost of the labor of putting them in place. The cost of the labor would be made up of two elements —the hourly wage and the number of hours consumed in doing the particular work. The proposal of the government is to equate the hourly wage and not to equate the number of hours. It is manifest, therefore, that the contention of the government is to equate only one element which makes up the cost of labor and to omit the other. It seems to us that this is utterly indefensible in the face of a contract requiring the whole cost of labor to be equated.

It seems to us there can be no escape from the conclusion that the term in the contract "cost of labor" must be construed, in all matters capable of physical comparison, the entire cost of labor and not a part of it only.

Of course, there are certain matters of maintenance which are not capable of a physical comparison, but, so far as a physical test can be applied, our contention is that it must be applied, because the contract states, in conformity with the assurances of the President and the requirement of the act of Congress, that, even under the proviso of paragraph (a) of Section 5, the physical test of reparation must be applied "as nearly as practicable."

The carriers say that the final test of the adequacy of expenditures as made by the director general under the proviso is whether or not the result was in each year of federal control "as nearly as practicable the same relative amount, character, and durability of physical reparation." This interpretation is in entire accord and harmony with the primary obligation. In the normal case, if consideration be given to the relative quantum

and use of the property, "the same relative amount, character and durability of physical reparation" must result in returning the property to the carrier "in substantially as good repair and in substantially as complete equipment as it was on January 1, 1918." The "money test" is, by the terms of the contract, made subject to the requirement of physical reparation. The "money test," therefore, can be applied only where no physical reparation measure can be found. It must then be applied for the purpose and to the end of, so far as practicable, accomplishing physical reparation and not to the end and with the purpose of avoiding the making of physical reparation.

If the interpretation suggested in the director general's brief is to prevail there are two absolutely independent and inharmonious standards of settlement, of which the director general may avail himself, neither one of which has, so far as results required are concerned, any dependency upon, or any direct relation to, the other, because the unquestioned measure of the expenditures required under the primary obligation is that they, together with the payment into funds, must accompany a return to the carrier of its property in substantially as good repair and in substantially as complete equipment as when taken over. On the other hand, under the proviso as interpreted by the director general, all that is required is that a certain amount of expenditures shall be made and it is immaterial what, if any, physical reparation resulted therefrom.

PAYMENT OF GUARANTY HELD UP

Payment of between $300,000,000 and $400,000,000 to the railroads on account of their six months' guaranty is held up as a result of a recent ruling of the comptroller of the treasury. This money is urgently needed at this time, the lack of which is causing a number of roads to be threatened by strikes of their employees because of the delay in paying their back wages. The ruling holds that the treasury cannot honor certificates issued by the Interstate Commerce Commission for partial payments in advance of the final determination of the amount of the guaranty.

The amount of the six months' guaranty is estimated at about $600,000,000, or the sum of the deficit incurred by the roads during the six months' period plus enough to make up a net operating income equal to half a year's standard return. Of the total, about $234,000,000 was covered by certificates issued by the Interstate Commerce Commission as "advances" on account of the guaranty as authorized by the law. It is understood that most of the roads had obtained what they imperatively required up to that time for interest, dividends, etc., but most of the roads had not figured until about September 1 the amount of back wages they would have to pay on account of the decision of the Railroad Labor Board of July 20. The amount of the back wages from May 1 to September 1 is about $200,000,000. At least two roads, foreseeing the delay in collecting their guaranty from the government, have asked authority from the Interstate Commerce Commission to borrow money from banks with which to pay back wages and other items of operating expenses. The Indiana Harbor Belt asked to borrow $2,200,000, saying it expected about $3,000,000 on final settlement of the guaranty, and the Richmond, Fredericksburg & Potomac also asked permission to borrow $250,000 solely for the purpose of paying wages.

The treasury department had also held up payment on various certificates issued by the Interstate Commerce Commission for loans to carriers under Section 210 of the act, and it also appears that many certificates have been held up that were issued by the commission under Section 204 of the act, which provides for the reimbursement of the short line railroads that were relinquished by the Railroad Administration for their losses during the period of federal control.

Many of the railroads also have sums due them from the Railroad Administration on account of their guaranty for the period of federal control which they will be unable to collect until they reach a final settlement with it, as it takes the position that it has already paid out as much as it is safe for it to do pending the settlements.

The question as to whether any relief can be afforded to the railroads from the decision of the comptroller of the treasury has been referred by the President to the Attorney General for an opinion. Alfred P. Thom, general counsel for the Association of Railway Executives, had appealed to the President to use his influence to bring about a reconsideration of the decision.

There has been a suspicion in many quarters that the Treasury Department has been resorting to technicalities to delay the payment of money to the railroads because it is having difficulty in providing the necessary funds and is obliged to borrow money frequently on temporary certificates of indebtedness. The Secretary of the Treasury, in an address before the American Bankers' Association on October 20, said that earlier plans and expectations of the Treasury Department "were disarranged by the unexpectedly large burdens placed upon the treasury by the Transportation Act."

In response to inquiries concerning the amounts of money which have been advanced to carriers under Section 209 of the Transportation Act, and loaned under Section 210 of the same act, the Treasury Department has issued the following statement, showing advances and loans to October 20 pursuant to certificate of the Interstate Commerce Commission:

Total advances to carriers under Section 209, Transportation Act, 1920.....	$233,719,974
Total loans to carriers under Section 210, Transportation Act, 1920.....	56,190,325

INCREASING EFFICIENCY

Statistics compiled by the Interstate Commerce Commission show not only that the railroads are handling about as heavy a tonnage of freight as they ever did, but also that considerable progress is being made in the campaign to speed up the movement of freight cars and to increase the average tonnage of freight loaded in each car, in order to increase the efficiency of the available supply of freight cars. The commission's statistics cover 44 of the larger railroads—those having annual revenues in excess of $25,00,000—for the month of July and the first seven months of 1920, as compared with the corresponding periods of 1919. Of these 44 roads, 29 show increases in the average miles per car per day for July, as compared with July, 1919, and 28 show increases for the seven months. The increases range from one to 27 miles. Practically all the roads show increases in the average car load, ranging from one to five tons. The roads have made efforts to enlist the co-operation of shippers in the heavy loading campaign, pointing out that an addition of two tons on the average in the amount of freight loaded in a car is equivalent to a saving of 150,000 cars. An increase of one mile in the average daily car movement is equivalent to an addition of 100,000 cars to the available car supply.

The clearing up of the freight car congestion is indicated by the weekly reports of the Car Service Division showing the principal accumulations of freight cars on hand in excess of current movement. During January and February the accumulations amounted to about 100,000 cars, resulting largely from the severe winter

weather. On April 3 the accumulations had been reduced to 93,000, but on April 16, after about two weeks of the outlaw switchmen's strikes, the number had risen to the unprecedented figure of 288,000. This has been gradually reduced to 41,135 on October 8, of which 17,952 were held awaiting export or coastwise movement. In years of heavy traffic an accumulation of 30,000 to 40,000 cars is considered normal, although at one time in 1919, when business was very light, the accumulations were only about 20,000.

Although the volume of traffic has been increasing, the car shortage has been reduced. During January and February the average daily car shortage (deferred car requisitions) was about 80,000. For the first week of April the average was 87,346; for the first week of May, 79,272; for the week of July 15, 115,872; for the week of August 15 it was 121,227; for the week ending September 1 it was 146,070; for the week ending September 8 it was 104,790, and for the week ending October 1 it was only 80,141.

One of the efforts of the railroads since March 1 has been to increase the percentage of home cars on home lines. Under the pooling policy of the Railroad Administration they became badly scattered. Before the war a percentage of 50 to 60 was regarded as normal. When the railroads were taken over in December, 1917, the percentage of home cars on home lines was 44. On March 1, when they were returned, it was 21.9. On October 1 it had been increased to 30. When the roads were returned a large number of coal cars were still in the west, where they had been sent during the coal strike, and an unusually large number of the western box cars were in the east. Special efforts were made to relocate the cars, both for the purpose of getting them back to the home lines for repairs, and for the purpose of getting them back to the territory in which particular types of cars were needed, but also to effect a better distribution of cars. Under orders issued by the Interstate Commerce Commission and by the Car Service Division of the American Railway Association, about 140,000 box cars have been ordered moved empty from eastern to western roads and a large number of coal cars from western to eastern roads until a close approach has been made to giving each district a number of cars equal to about 100 per cent of its ownership. It is calculated that in a time of car shortage the most practicable basis of distribution in general is the ownership basis, and now that the various districts have been built up to approximately 100 per cent, efforts are being made to maintain that condition by a plan of equalization in interchange between railroads and also by individual orders to effect a better equalization of cars in proportion to ownership among the individual roads in each district.

Charges are sometimes made against the railroads that they are themselves wasting cars by holding an undue number of cars under load with company freight. A constant check of this situation is kept by the Car Service Division and individual instances which seem to indicate excessive holding of cars for this purpose are brought at once to the attention of the officers of the road involved. The report for the week ending October 8 shows that a large reduction in the total of cars thus held has been made during the year. Only 37,017 cars were held under load with company material, as compared with 39,014 for the preceding week. On January 1, 1920, the total was 54,000 cars.

COMMISSION ASKS FOR STATEMENT OF CLAIMS

The Interstate Commerce Commission has issued a questionnaire on which railroads that accepted the guaranty provisions of the transportation act are required to file on or before January 1, 1921. This calls for the complete information desired by the commission for the purpose of making settlements with the carriers as to the amounts necessary to make good the guaranty provided for in Section 209 of the act, which the commission is required to certify to the treasury. Under the law the commission is also to determine the amount which may be charged to maintenance for the guaranty period for the purposes of fixing the amount of the guaranty. In the questionnaire it is stated that consideration has been given to the matter of formulas to be applied in making adjustment of maintenance expenses, but no such formulas have yet been adopted by the commission. Each respondent carrier may, therefore, prepare and submit data with respect to the adjustments which it may propose in connection with maintenance expenses. The principal factors which the commission will consider in fixing the amounts to be included in operating expenses for the guaranty period for maintenance of way and structures and for maintenance of equipment are: (a) The differences in the cost of labor and material; (b) the difference in the amount of property used; and (c) the difference in the use of the property during the guaranty period as compared with the test period.

Instructions are also given for the filing of the other information called for as to the results of the guaranty period.

MANGANESE STEEL IN TRACK WORK*

BY J. B. STRONG

Chairman, Standardization Committee, Manganese Track Society, and Vice-President, Ramapo Iron Works, Hillburn, N. Y.

MANGANESE steel as usually furnished is a metal containing 10 to 14 per cent of manganese, 1 to 1.40 per cent of carbon, not over 0.10 per cent of phosphorous, not over 0.06 per cent of sulphur, 0.25 to 0.40 per cent of silica, and the remainder being iron. The peculiar merit of manganese steel in resisting abrasive wear results from the combination of strength and ductility. It is only moderately hard and will not maintain a cutting edge, but is very strong and tough and cannot be machined commercially at normal temperature except by grinding.

Economy has been the first reason for the introduction and increased use of manganese steel in track work to meet severe service conditions. Nowhere in track work has manganese steel proved of such economy as on the turnout switch point which takes the heavy side thrust wear for train movements into the turnout or crossover. Manganese steel gives the greatest efficiency when subjected to wear without pounding, as on a switch point where its life as compared with carbon steel is phenomenal. It is not unusual to get records of 10 to 20 times the life of a carbon rail point.

The Track committee of the American Railway Engineering Association, in conference with the Standardization committee of the Manganese Track Society and the Manganese Steel Founders Society, has developed plans for many units of special track work. In these designs the first consideration was to provide a manganese steel wearing surface to take all extra shock and wear incidental to carrying wheels across the intersection of the gage lines at the frog point for both facing and trailing train movements. Manganese steel is carried into the throat, and also into the wing flare to take care of wheel flange wear on both sides for wheels entering the frog. The tread surface is provided sufficiently wide to take the

*Presented before the St. Louis Railway Club, St. Louis, Mo., on September 23.

wear of badly worn double flanged wheels. Other considerations were the lapping of the manganese steel wearing thread surface with the open hearth rail so that the change from one to the other would not be abrupt, attaching the open hearth rails securely to the manganese casting and to each other for a rigid structure; providing straight lines where possible for economy of machine work and fabrication; distributing metal for strength and sound castings. This is one of the most important, as manganese, in cooling, has a shrinkage about double that of other steels, and the annealing process of quenching from a high heat in water is severe and necessitates careful attention to the correct distribution of metal to avoid excessive internal strains.

A manganese frog properly installed and maintained should give a life approximately equal to that of adjacent open hearth rail. I have records of manganese rail bound frogs maintained in service for 275 millions tons traffic and then being removed on account of the wear on rail arms and adjacent rails rather than wear of the manganese steel.

Manganese steel turnout frogs will give better comparative life than crossing frogs, for as the angle increases up to 90 deg. the pound at the intersection increases, which manganese steel cannot so well withstand.

Roughly, it might be stated that 90 deg. manganese steel crossing frogs giving over double the life of O. H. carbon steel are doing well, while as the angle decreases we secure a greater life down to a No. 10 turnout frog, which gives 6 to 10 times greater life than open hearth carbon steel.

WOOD PRESERVATION STATISTICS FOR 1919

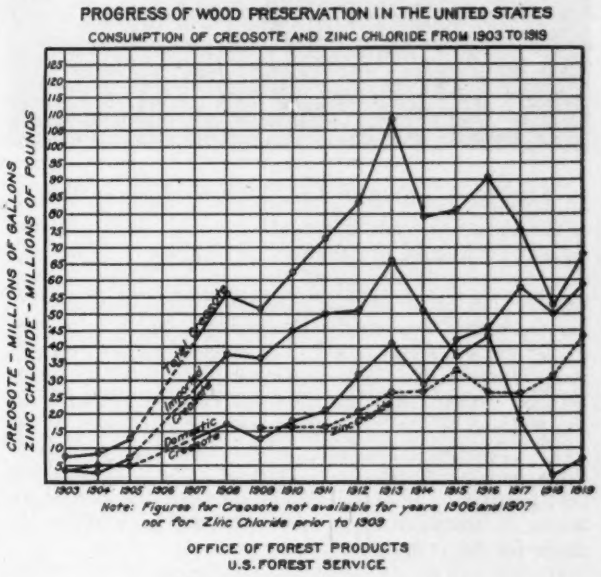
THE NUMBER of railway cross ties subjected to preservative treatment in 1919 was 37,567,927, which is 6,958,718 more ties than were treated in 1918. However, the total as reported for 1919 is small when compared with the 43,846,987 ties treated in 1914, the record year. These are typical facts presented in the statistical section of the proceedings of the American Wood Preservers' Association for 1920, as prepared by R. K. Helphenstine, Jr., of the United States Forest Service, Washington, D. C.

In 1919 there were 108 plants actively engaged in the preservative treatment of wood in the United States. These plants treated a total of 139,878,584 cu. ft. of material, a net increase of 17,265,694 cu. ft. over the quantity reported by the 107 plants that were active in 1918.

Aside from ties, the above total quantity of material treated includes 13,557,519 lin. ft. of piling, 816,046 poles, 1,795,687 sq. yd. of paving blocks, 144,742,477 ft. b. m. of construction timber, 121,507 cross arms and 8,113,629 ft. b. m. of miscellaneous lumber. This indicates an increase in all the items except paving blocks, cross arms and miscellaneous lumber.

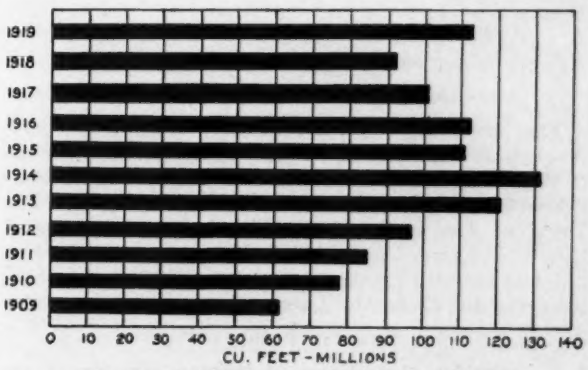
During the year covered by this report, 25,556,247 gal. of creosote, 2,412,592 gal. of paving oil and 102,011 gal. of miscellaneous preservatives were used by the treating plants of the United States. The quantity of zinc chloride employed was 43,483,134 lb., and constitutes the largest consumption of this preservative ever reported by the industry during the eleven years that these statics have been gathered. The 1919 consumption of creosote represents an increase over the quantity used in 1918 of 12,779,861 gal., while the 102,011 gal. of miscellaneous preservatives reported exceeded the quantity reported last year by 73,998 gal.

The most comprehensive idea of the progress of timber preservation in the United States since the beginning of the present century, which encompasses practically the entire period of commercial development, is obtained from the chart showing the consumption of preservatives from 1903 to 1919, inclusive. The most distinctive feature brought out by this chart is the gradual increase in the relative quantity of zinc chloride and the general tendency to replace foreign creosote by the domestic during the last six years.


PROGRESS OF WOOD PRESERVATION IN THE UNITED STATES
CONSUMPTION OF CREOSOTE AND ZINC CHLORIDE FROM 1903 TO 1919
CREOSOTE - MILLIONS OF GALLONS
ZINC CHLORIDE - MILLIONS OF POUNDS
Total Creosote
Imported Creosote
Domestic Creosote
Zinc Chloride
1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919
Note: Figures for Creosote not available for years 1906 and 1907 nor for Zinc Chloride prior to 1909
OFFICE OF FOREST PRODUCTS
U.S. FOREST SERVICE

The present status of cross tie preservation is shown by the chart comparing the cubic feet of cross ties treated from 1909 to 1919, inclusive, in which it is seen that the industry has recovered from the slump experienced during 1917 and 1918 and now has a larger output than for any other previous year, with the exception of 1913 and 1914. The ranking of the various species of wood subjected to treatment in ties is as follows: Pine, 13,896,820; oak, 13,082,530; Douglas fir, 4,085,950, and western pine, 1,641,265.

Of the total number of ties, 26,662,277 were hewed and 10,905,650 were sawed. That some progress has been made in the adzing and boring of the ties before treatment is indicated by the fact that 4,914,379 ties were both adzed and bored for use on steam railroads and smaller numbers were either adzed or bored alone. As in the case of 1918, more cross ties were treated with zinc chloride than with creosote, the number receiving zinc chloride being 19,637,448 and creosote 14,979,405. A total of 2,950,074 were given the emulsion treatment and 1,000 ties were treated with other preservatives.



Ties Treated During the Last Eleven Years

AMERICAN RAILWAY ENGINEERING ASSOCIATION

The most important action taken by the meeting of the Board of Directors of the American Railway Engineering Association in its meeting at Montreal on October 11 was the decision not to affiliate with the Federated Engineering Societies. Besides the Proceedings, which were sent to the members last month, the association has recently issued bulletin No. 228 containing discussions by members on various subjects, although relating primarily to the welfare of the association and the extension of its work. Another bulletin is to be issued shortly containing a monograph on the conduct of railway engineering field parties. The secretary has received one committee report in tentative form and will soon have others in shape for the printers.

ROADMASTERS' ASSOCIATION

Work is now in progress on the preparation of the report of the recent convention of the Roadmasters' Association and it is expected that this will be issued to the members sooner than was done last year. It is planned to hold a meeting of the executive committee in the near future for the purpose of selecting committee members and otherwise starting the work of the year.

MAINTENANCE OF WAY MASTER PAINTERS

The Maintenance of Way Master Painters' Association held its annual convention at the Ft. Shelby Hotel, Detroit, Mich., on October 5-7, inclusive, with an attendance of about 35 members. The program followed closely that published tentatively in these columns in past issues. H. F. Jones, master painter, Cleveland, Cincinnati, Chicago & St. Louis, Wabash, Ind., was re-elected president, and Buffalo, N. Y., was selected as the place of next meeting to be held on October 4, 5 and 6, 1921. A complete report of this meeting will appear in the *Railway Maintenance Engineer* for December.

AMERICAN WOOD-PRESERVERS' ASSOCIATION

The proceedings of the American Wood-Preservers' Association has been sent to the members and a review of this volume will be found on another page. This association has also issued another publication entitled "The Decay of Ties in Storage," which is in the form of a handbook designed to enable tie inspectors and others to differentiate between those wood fungi that produce actual decay and those which are relatively harmless.

THE TIE PRODUCERS

The National Association of Railroad Tie Producers is making extended plans for its convention, which will be held in San Francisco, Cal., next January, immediately following the convention of the American Wood-Preservers' Association. An aggressive campaign for membership is under way with the result that a number of the largest producers of cross ties have joined the association. It is hoped that by the time of the next convention the membership of this association will include a large percentage of the tie producers of the country.

THE MATERIAL MARKET

WHEN PRICES are on the decline and business is diminishing, it is very difficult to determine just what the actual quotations are, because of the reluctance of the seller to admit his willingness to take a reduced price. In this connection, it is interesting to note that one large purchaser of iron and steel has announced publicly that he had obtained material at prices considerably below those quoted. A new factor in the field has been a reduction in the manufacture of agricultural implements and tractors as a result of a reduced demand. In view of this general tendency and in spite of the efforts to minimize reductions in prices there has been some softening of prices in the railroad iron and steel market. While this has not been manifested in track supplies, it is clearly indicated in the case of structural steel, in which there have been further reductions of the maximum prices. The present price of cast-iron pipe, which was raised only a month ago, is being maintained with difficulty. In fact, some manufacturers are now offering discounts from this price. The unfilled tonnage of the United States Steel Corporation still remains large, aggregating 10,374,804 tons on September 30, or only a decline of 3.56 from the previous month.

	Price in Cents Per Pound			
	September 24		October 21	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	4.00 to 4.25	3.73 to 4.38	4.00 to 4.25	3.73 to 4.38
Track bolts	6.00 to 6.50	4.98 to 5.38	....	4.98 to 5.38
Boat spikes	4.40 to 5.00	....	4.40 to 5.00	....
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	....	3.00 to 4.00	....	3.00 to 4.00
Tie plates, iron	....	3.75 to 4.00	....	3.75 to 4.00
Plain wire	3.25 to 4.00	3.63 to 4.38	3.25 to 4.00	3.63 to 4.38
Wire nails	3.25 to 4.50	3.63 to 4.88	3.25 to 4.50	3.63 to 4.88
Barbed wire, galv	4.10 to 5.10	4.48 to 5.48	4.10 to 5.10	4.48 to 5.48
C. I. pipe, 6 in. or larger (per ton)		$83.10		$83.10
Plates	2.65 to 3.50	3.03 to 3.88	2.65 to 3.25	3.03 to 3.63
Shapes	2.45 to 3.50	2.83 to 3.63	2.45 to 3.10	2.83 to 3.48
Bars (steel)	2.35 to 3.50	2.73 to 3.88	2.35 to 3.25	2.73 to 3.63

The rail situation remains unchanged. Rolling schedules for next year have been generally arranged for by the roads but the question of price is still unsettled, except as it may have been done privately for individual orders.

The price of scrap has fallen. Thus, a comparison of the figures for maintenance of way items given in the table below with those of the month previous will show a decline of $3 to $4 per ton in practically all items. The present prices are on a par with the lowest ebb of the market at the beginning of 1919.

	Per Gross Ton	
	Chicago	St. Louis
Relaying rails	$57.50 to $62.50	$40.00 to $45.00
Rerolling rails	33.50 to 34.00	32.00 to 32.50
Rails less than 3 ft. long	23.50 to 24.00	21.00 to 21.50
Frogs and switches, cut apart	20.50 to 21.00	21.00 to 21.50
	Per Net Ton	
No. 1 railroad wrought	20.00 to 20.50	21.00 to 21.50
Steel angle bars	21.00 to 21.50	19.00 to 19.50

Much has been said about the price of lumber, the manufacturers having taken considerable pains to point to reductions in prices as an argument for increasing building programs. A comparison of mill prices of standard yellow pine items for October 25, September 27 and July 26 of the current year show that average reductions during the last month range all the way from zero to $6, while the reduction in the preceding two months did not exceed $1.50. In the case of Douglas fir greater reductions have occurred. These varied from $3.50 to $10 in the last month and from zero to $6.50 in the preceding two months. These reductions, however, still leave the prices far above those of pre-war days.

GENERAL NEWS DEPARTMENT

The United States Railroad Labor Board began hearings on October 18, at Chicago, to determine what wages should be paid employees of the various short line railroads.

The staff of officers and employees of the Railroad Administration on August 20 consisted of 1,195 persons, with a monthly payroll of $250,576. In June, 1919, the total force was 2,725 and the monthly payroll was $575,428, while on March 1 it was reduced to 1,223 officers and employees.

Seven persons were killed and 20 injured when an eastbound passenger train on the New York Central sideswiped a westbound passenger train at Erie, Pa., on October 20. The statement was made at the general offices of the company that the accident was due to the throwing of a switch under the train.

The American Railroad Association has organized a freight claim prevention campaign as a means of reducing the enormous payments which the railroads must make for loss and damage to freight. To this end a committee on cause and prevention of the freight claim division of the association has been formed under the direction of Lewis Pilcher, secretary of the division.

The American Engineering Council of the Federated American Engineering Societies will hold its first meeting at the New Willard Hotel, Washington, D. C., on November 18 and 19. On the 19th permanent officers will be elected and a constitution and by-laws will be presented for adoption. The Federated American Engineering Societies was organized at Washington last June at which time 66 societies were represented at the meeting.

The Bridge and Tunnel Commission, which, on behalf of the states of Pennsylvania and New Jersey, is to begin studies for the construction of a bridge across the Delaware river at Philadelphia, has been organized and recently chose the members of a board of engineers to prepare plans. These engineers are Ralph Modjeski, of Chicago, chairman; George S. Webster, chief of the bureau of surveys, Philadelphia, and Lawrence A. Ball, of East Orange, N. J.

A joint committee on automatic train control was recently appointed by President R. H. Aishton of the American Railroad Association to study this important subject and hold conferences with the Interstate Commerce Commission. A meeting of this committee was held on October 20 at which time C. E. Denney, vice-president and general manager of the New York, Chicago & St. Louis, was elected chairman and several divisions of the committee formed.

A "no-accident" campaign has been started on the Baltimore & Ohio and will end November 16. During the campaign every effort is to be exerted to prevent injury to employees and patrons of the road. The various divisions will be in competition against each other and the division which makes the greatest improvement in the number of accidents over the same period last year will be awarded a pennant, to be displayed at division headquarters.

Litigation over the proposed bridge over the Hudson river at Castleton, N. Y., eight miles below Albany, has ended and the New York Central is free to build the structure after its original design. The litigation arose because some interests in Albany feared the proposed Castleton cut-off would take considerable railway traffic out of the city. The cost of the bridge which the New York Central intends some day to build is variously estimated at from $10,000,000 to $20,000,000.

The automatic train control problem was the subject for discussion at the rooms of the Western Society of Engineers, Monadnock building, Chicago, on the occasion of a joint meeting of the Western Society and the Chicago Sectional committee, Signal division, American Railway Association. The principal feature of the evening was the presentation of papers prepared by W. P. Borland, chief, Bureau of Safety, Interstate Commerce Commission, and W. B. Murray, chief engineer, Miller Train Control Corporation.

A large attendance of employment managers, representatives of employment bureaus and educators is expected at the conference of employment and vocational education, which will be held at the Congress Hotel, Chicago, on Friday, November 12. This conference, which is sponsored by the American Association of Engineers, will consider the problems of employment which are confronted by noncommercial employment bureaus and will discuss the relation between employment service and education.

Preliminary statistics issued by the Bureau of Railway Economics show that the operating revenues for class 1 roads in 1919 amounted to $5,184,230,000, an increase of 5.2 per cent over 1918. The operating expenses aggregated $4,419,989,000, an increase of 10 per cent over 1918. Maintenance of way expenditures amounted to $778,105,000, an increase of 18.5 per cent. The net operating revenue amounted to $764,241,000, a decrease of 16 per cent. The operating income totaled to $564,130,000, a decrease of 21.8 per cent, while the net operating income was $515,793,000, a decrease of 25.6 per cent.

"The Creeping of Railroad Rails" is the title of a paper by Dr. J. A. L. Waddell, 35 Nassau street, New York, which has been published by the American Society of Civil Engineers. This paper contains the information secured in reply to a questionnaire submitted to railway officers and other authorities on this subject in North America. In view of the recently established practice of the society to send advance copies of papers only to those particularly interested, this paper will not receive general distribution at present. As it is desired to secure a thorough discussion of this important subject, those interested can secure copies on application to the author.

Statistics on the manufacture of cars for the first eight months of the present year show that 34,564 freight cars and 168 passenger cars have been manufactured and delivered up to the end of August. Of these totals, 24,056 freight cars and 70 passenger cars were for domestic use and 10,508 freight cars and 98 passenger cars were for export. The number of cars on the order books of the car manufacturers on August 31, 1920, totaled 57,016 freight cars and 936 passenger cars and of these totals 49,442 freight cars were on domestic orders and 7,574 were on foreign orders. Similarly, the passenger cars on domestic orders amounted to 861 and those on foreign orders to 75.

A committee of the American Association of Engineers, consisting of George W. Hand, assistant to the president, Chicago & North Western, and Chairman of the National Railroad Council of A. A. E.; J. B. Jenkins, valuation engineer of the Baltimore & Ohio; C. C. Burritt, office engineer of the Southern Railway, and R. C. Bailey, district secretary of the association in Washington, presented to the Interstate Commerce Commission on October 1, a request for a new definition of the term "engineers of mechanics." The recommendation is that there shall be included in the group within the term 'subordinate officials' the following: "Technical Engineers. This class shall include all professional engineers, assistant engineers, engineer assistants, instrumentmen, rodmen, chainmen, designers, draftsmen, computers, tracers, chemists, architects, engineer supervisors, engineer inspectors, and all other employees engaged in office or field work in any department and performing engineering work. None of the foregoing who have authority to employ, discipline or dismiss subordinates shall be included."

PERSONAL MENTION

GENERAL

C. S. Gzowski, who has been special engineer on the Canadian National, with headquarters at Toronto, Ont., has been appointhed assistant to S. J. Hungerford, vice-president in charge of operation, effective October 1.

W. W. K. Sparrow, assistant to president of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, and formerly corporate chief engineer, has been given general charge of the accounting department.

George M. Huss, who resigned some months ago as chairman of the committee on claims of the Railroad Administration, has been appointed assistant to the director of liquidation claims, with office at Washington, D. C.

W. D. Kinzie, division engineer on the Philadelphia & Reading, with headquarters at Reading, Pa., has been promoted to assistant superintendent of the Shamokin division, with headquarters at Tamaqua, Pa.

H. Wilson, engineer maintenance of way of the eastern division of the Chicago Great Western, with headquarters at Chicago, has resigned, to become trainmaster on the Denver & Rio Grande, with headquarters at Denver, Colo., effective October 15.

T. W. Fatherson, engineer maintenance of way on the Chicago Great Western, with headquarters at Des Moines, Iowa, has been promoted to superintendent of the Western division, with headquarters at Clarion, Iowa, succeeding **S. V. Rowland**, transferred.

J. B. Mabile, assistant engineer maintenance of way on the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., has been appointed supervisor of work equipment, with headquarters at Chicago, effective September 16, succeeding **A. L. Greenabaum**, who has resigned to become manager of the O. F. Jordan Company, East Chicago, Ind.

James A. McCrea, vice-president of the Bankers' Trust Company of New York, and formerly an engineering and operating officer on the Pennsylvania, has been elected vice-president of the Pennsylvania, in charge of the Central region, with headquarters at Pittsburgh, Pa., succeeding **R. L. O'Donnell**, who died on September 28, as noted elsewhere in these columns. Mr. McCrea was born in Philadelphia in 1875 and graduated from Yale University in 1895. He began railroad work as a rodman in the chief engineer's office of the Pennsylvania Lines West in 1895 and was transferred to the maintenance of way department of the Cleveland and Pittsburgh division in 1896. He was again transferred in 1897 to the Philadelphia division, Lines East. He was appointed assistant engineer maintenance of way of the Lines East in May, 1899, and in August of the same year was promoted to engineer maintenance of way of those lines. Mr. McCrea was promoted to superintendent of the Cincinnati division, western lines, in June, 1901, which position he held until 1906, when he was appointed general superintendent of the Long Island, becoming general manager in 1911. In October, 1917, he was appointed on the staff of Brigadier General W. W. Atterbury and assigned to service in France as a colonel, receiving the Distinguished Service Medal of the United States Government and being made an Officer of the French Legion of Honor for this service. He became vice-president of the Bankers' Trust Company after his return to the United States in 1919.

James A. McCrea

ENGINEERING

W. E. Rivers has been appointed division engineer on the Canadian National, with headquarters at Kamloops Junction, B. C.

R. C. Bardwell, chief chemist for the Missouri Pacific, with headquarters at St. Louis, Mo., has been appointed engineer of water service, with the same headquarters.

W. C. Allen has been appointed assistant valuation engineer of the Fort Worth & Denver City and the Wichita Valley, with headquarters at Fort Worth, Tex.

F. D. Nauman, roadmaster on the Oregon Short Line, with headquarters at Cache Junction, Utah, has been promoted to division engineer, with headquarters at Pocatello, Idaho, succeeding **William Travers**, deceased, as noted elsewhere.

E. W. Engelbright, engineer for the Union Pacific in New York City, with offices at 120 Broadway, and his entire staff, were transferred to Omaha, Neb., October 22, where this office was consolidated with that of E. E. Adams, assistant to the president.

J. S. Goodman, division engineer of the Philadelphia & Reading at Tamaqua, Pa., has been transferred to Reading, Pa., succeeding **W. D. Kinzie**, promoted, as noted elsewhere. **N. W. H. Schafer**, division engineer at Harrisburg, Pa., has been transferred to succeed Mr. Goodman.

C. B. Brown, chief engineer of the Canadian National and the Grand Trunk Pacific, with headquarters at Moncton, N. B., has been appointed engineering assistant to S. J. Hungerford, vice-president, with headquarters at Toronto, Ont. **A. F. Stewart**, chief engineer at Toronto, Ont., has been transferred to Moncton, N. B., succeeding Mr. Brown. **H. T. Hazen**, engineer maintenance of way, with headquarters at Toronto, will temporarily perform the duties of chief engineer at this point in addition to his own.

Robert Walton Williams, whose appointment as assistant to chief engineer of construction of the Southern Railway System, with headquarters at Washington, D. C., is announced elsewhere in this issue, was born November 30, 1876. He entered the construction department of the Southern Railway in 1905 as a rodman and served consecutively as levelman and transitman until 1910, when he was promoted to assistant engineer. In 1914 he was made district engineer with office at Birmingham, Ala., which position he held until his recent appointment to assistant to chief engineer of construction, as noted above.

L. G. Wallis, engineer of construction of the Jacksonville Terminal Company, with headquarters at Jacksonville, Fla., has been appointed district engineer on the Southern Railway, with headquarters at Toccoa, Ga., succeeding **R. O. Parsons**. **R. W. Jones**, district engineer, with headquarters at Lexington, Ky., has resigned to enter private practice. **R. W. Williams**, district engineer, with headquarters at Birmingham, Ala., has been promoted to assistant to the chief engineer of construction, with headquarters at Washington, D. C. The office of district engineer at Birmingham has been abolished.

William R. Dunn, supervisor on the Philadelphia & Reading, with headquarters at Philadelphia, Pa., has been appointed division engineer of the Harrisburg division, with office at Harrisburg, Pa., succeeding **Norman H. Schafer**, transferred. Mr. Dunn was born in November, 1878, at Philadelphia, Pa. He was graduated in 1905 from the Pennsylvania State College and entered railroad service the same

year as assistant supervisor of track in the service of the Atlantic City Railroad. In 1909 he went with the Philadelphia & Reading as assistant supervisor of the Philadelphia division, subsequently becoming supervisor, with office at Philadelphia, from which position he was appointed division engineer, as noted above.

Daniel B. Packard, whose appointment to the position of office engineer on the Atlantic Coast Line, is announced elsewhere in this issue, was born on January 8, 1881, at Greenville, Pa., and was graduated in 1904 from the Engineering College of Cornell University. He entered the service of the Bessemer & Lake Erie as a draftsman and transitman in the maintenance of way department at Greenville, Pa. Later he entered the employ of the Norfolk Southern as resident engineer of construction and chief party on location, with office at Norfolk, Va., then going to the Atlantic Coast Line in 1912, where he served consecutively as resident engineer on construction, assistant engineer and pilot on valuation, division engineer of construction and then engineer of surveys, from which position he was promoted to that of office engineer at Wilmington, as noted above.

H. M. Lull, whose promotion to engineer maintenance of way of the Southern Pacific, Texas and Louisiana Lines, with headquarters at Houston, Tex., was noted in last month's issue, was born at Windsor, Vt., on March 31, 1875. He graduated from Dartmouth College in 1897 and entered railway service with the Southern Pacific as a draftsman in May, 1906. In 1907 he was promoted to assistant engineer on the Western division, and during 1908 and 1909 served as draftsman and computer in the construction department. Mr. Lull was promoted to assistant engineer on the construction and electrification of the Southern Pacific's electric lines in California and Oregon in 1909, which position he held until 1915, when he became assistant division engineer of the Portland division, later being promoted to division engineer, which position he held until his recent appointment.

J. L. Suesserott, assistant engineer in the maintenance of way department of the Baltimore & Ohio, with office at Pittsburgh, Pa., has been promoted to division engineer of the New York division, with headquarters at St. George, Staten Island, N. Y., succeeding **H. W. Ordeman,** resigned. Mr. Suesserott was born at Chambersburg, Pa., on May 19, 1882. In August, 1902, he entered the service of the Baltimore & Ohio, where he has remained continuously, serving as axeman and transitman in the survey department until June, 1910, when he was promoted to assistant engineer in the maintenance of way department, with headquarters at Wheeling, W. Va. On December 9, 1914, he was promoted to assistant division engineer of the Pittsburgh division, with office at Pittsburgh, Pa. On May 6, 1916, he was appointed assistant engineer of the Pennsylvania district, with the same headquarters, from which position he was made division engineer, as noted above.

TRACK

E. A. Haner has been appointed roadmaster on the Missouri Pacific, with headquarters at Eudora, Ark., succeeding **R. W. Manning,** resigned.

C. E. Cherry has been appointed acting roadmaster on the Missouri Pacific, with headquarters at Auburn, Neb., succeeding **M. L. Melson,** deceased.

George L. Dunn has been appointed track supervisor on the Greenwood Lake Railroad (Erie), with headquarters at Jersey City, N. J.

C. H. Shasteen has been appointed track inspector of the Northern district of the Atchison, Topeka & Santa Fe, with headquarters at La Junta, Colo., succeeding **T. I. Kincaid,** assigned to other duties.

William Possinger has been promoted to track supervisor on Subdivision No. 2 of the New York, Susquehanna & Western, with headquarters at Butler, N. J. He was born at Reeders, Pa., on August 24, 1877, and entered the employ of the New York, Susquehanna & Western on October 12, 1897, being promoted to section foreman at Clifton, Pa., in February, 1904, and transferred two months later to Ash Gap, Pa., in the same capacity. In October, 1905, he was again transferred to Summit Switch, Pa., and in May, 1907, to Bartonville, Pa. In October, 1909, he was made foreman of the shops at Stroudsburg, Pa. During the summer of 1918 he served as extra gang foreman on Subdivision No. 2, but returned to the Stroudsburg shops in the fall of 1918 as foreman, in which position he remained until his appointment as track supervisor on October 1, 1920.

Patrick Pheney has been promoted to general track supervisor on the Oregon Short Line, with headquarters at Pocatello, Idaho. He was born at Albia, Iowa, on February 22, 1862, and entered railway service as a section laborer in 1885. In 1887 he became extra gang foreman on the Denver & Rio Grande, later being promoted to roadmaster. Mr. Pheney entered the service of the Oregon Short Line in 1897 as a section foreman on the Montana division, since which time he has served as roadmaster and foreman on various divisions of this line.

Charles H. Morse, whose appointment as supervisor of track on the New York Central was announced in the October issue, was born September 14, 1885, at Brandon, Vt. He entered railroad work on August 13, 1902, as a clerk in the office of the superintendent of the Rome, Watertown & Ogdensburg division of the New York Central, at Watertown, N. Y. After five years' service in different capacities in this office he was transferred to the maintenance of way department, serving subsequently as chainman, rodman and transitman at the same place, and in October, 1909, was promoted to draftsman in the office of the engineer maintenance of way at New York City. During the time he was located in New York he took special courses at Columbia University. In June, 1913, he was promoted to second assistant supervisor of track, with headquarters at Hudson, N. Y., and in the following October was promoted to assistant supervisor of track at Poughkeepsie, N. Y. On May 1, 1915, he was appointed general foreman at Corning, N. Y., from which position he was promoted to supervisor of track, with headquarters at Clearfield, Pa., as noted above.

BRIDGE

Samuel P. Coffin, supervisor of bridges and buildings of the Boston & Maine, with headquarters at Boston, Mass., has been transferred to Salem, Mass., succeeding **B. F. Pickering,** deceased.

M. R. Strong, masonry designer on the Southern Railway at Toccoa, Ga., has been promoted to bridge engineer, with headquarters at Washington, D. C.

George G. Thomas, office engineer of the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been promoted to engineer of bridges, with the same headquarters, succeeding **M. E. Nelson,** resigned. **D. B. Packard** has been appointed office engineer to take the place vacated by Mr. Thomas.

J. F. Cullen, foreman of bridges on the Utah division of the Oregon Short Line, has been promoted to supervisor on the Utah division, with headquarters at Pocatello, Idaho, with jurisdiction over the east end of that division, while **A. H. King** retains jurisdiction over the south end of the division, transferring his headquarters from Pocatello, Idaho, to Salt Lake City, Utah, these changes having occurred on account of the death of P. E. Parsons, as noted elsewhere.

O. V. Chesney, whose appointment to supervisor of bridges and buildings of the Southern district of the Portland division of the Southern Pacific, Pacific System, with headquarters at Portland, Ore., was noted in last month's issue, was born at Brownville, Ore., on November 15, 1880. Mr. Chesney entered railway service as a carpenter's helper on July 5, 1904, and was promoted to carpenter on August 1, 1905. On November 1, 1910, he was promoted to foreman, which position he held at the time of his recent advancement.

PURCHASES AND STORES

U. K. Hall, general storekeeper of the Union Pacific, with headquarters at Omaha, Neb., has been appointed general supervisor of stores of the Union Pacific System, with the same headquarters, effective September 28.

W. W. Morris, assistant to the general purchasing agent of the Pennsylvania, with headquarters at Philadelphia, Pa., has been appointed purchasing agent of the Northwestern region of that system, with headquarters at Chicago, succeeding **I. B. Thomas,** deceased.

E. V. Reinhold, assistant to the manager of purchases and stores of the New York Central Lines, with headquarters at Buffalo, N. Y., has been appointed assistant purchasing agent, in charge of fuel, of the New York Central Railroad, with headquarters at New York, effective October 15.

OBITUARY

A. S. Markley, master carpenter on the Chicago & Eastern Illinois, with headquarters at Danville, Ill., died suddenly on October 14.

W. A. Hall, assistant engineer in the construction department of the New York Central, died recently at Morrisville, N. Y., at the age of 46.

Richard L. O'Donnel, vice-president at the head of the Central region, Pennsylvania System, with headquarters at Pittsburgh, Pa., died on September 28 at New York City, after an illness of several weeks.

Richard L. O'Donnel

Mr. O'Donnel was born at Philadelphia, Pa., on November 5, 1860, and graduated from the Polytechnic College of Pennsylvania in 1882. He entered railway service with the Pennsylvania in 1883 as a rodman and from that year until 1896 served successively as assistant supervisor, acting assistant superintendent, supervisor of the Altoona yard, and assistant engineer of the Tyrone division, being promoted in 1896 to assistant engineer in the principal assistant engineer's office at Altoona, Pa. In February, 1897, Mr. O'Donnel was promoted to assistant superintendent of the Pittsburgh division and in 1902 was made superintendent. From 1903 until 1911 he served as general superintendent of the Buffalo and Allegheny Valley division, being transferred to the Western Pennsylvania division in the latter year. He was promoted to assistant general manager of the lines east of Pittsburgh in 1917 and to general manager in 1918, serving in that capacity under federal control. In March, 1920, when the Pennsylvania System was reorganized, Mr. O'Donnel was made executive officer of the Central region.

Richard Lamb, at one time chief engineer of the Wilmington & Newburn, now a part of the Atlantic Coast Line, died at his home in Brooklyn, N. Y., on October 18. Mr. Lamb was a well known consulting engineer. Born in Norfolk, Va., he graduated from Brown University and commenced his engineering career with the surveying of the Albemarle and Chesapeake canal.

William Travers, division engineer on the Oregon Short Line, with headquarters at Pocatello, Idaho, and **P. E. Parsons,** supervisor of bridges and buildings, with headquarters at Nampa, Idaho, together with the operator of their motor car, were burned to death in a fire in a hotel at Robinette, Idaho, on October 5. They were engaged in the annual bridge inspection at the time they were killed.

John D. Isaacs, Jr., chief engineer of S. J. Junkins & Co., Ltd., was killed October 1 by the accidental discharge of a shotgun while duck hunting at Lake Manitoba, Canada. Mr. Isaacs was born in Oakland, Cal., in 1882 and received his education at the University of California. Prior to his graduation he served as engineer of construction of the Yosemite Valley Railway for one year. After leaving college he entered the service of the Harriman System in the engineering department, having charge of the location and construction of the line from Chehalis to Aberdeen, Wash. He was later engaged in track elevation and building construction work for the Oregon-Washington Railroad & Navigation Company in Spokane. Mr. Isaacs had been affiliated with S. J. Junkins & Co. for the past few years, having had charge of extensive wharf and dock work carried out by that company for the Canadian Pacific at Vancouver. He also had charge of hydro-electric surveys and development work in the Canadian Northwest, while at the time of his death he was in charge of the work of lining the Connought tunnel of the Canadian Pacific.

Edwin Thacher, consulting engineer and formerly chief assistant engineer of the Louisville Iron & Bridge Company, Louisville, Ky., died at his home in New York City on September 21 at the age of 81. Mr. Thacher was born at De Kalb, N. Y., on October 12, 1839, and received his education at Rensselaer Polytechnic Institute, graduating in 1863. From 1863 until 1868 he served successively as assistant engineer on the Cedar Rapids & Missouri River Railroad, on the United States Military Railroads, and on the Louisville, Cincinnati & Lexington. In 1868 he entered the structural engineering field in which he held a prominent place for more than 30 years. Mr. Thacher was the holder of numerous patents in structural engineering, including several in reinforced concrete design.

A Locomotive Booster.—The latest development in locomotive design of first magnitude is a device for increasing the tractive power of any locomotives equipped with trailer wheels whereby the trailers may be trnsformed into drive wheels whenever the engineman feels that the additional tractive power is necessary. A small two-cylinder steam engine is placed underneath the cab in a position where it is connected to the trailer axle through a train of gears which may be thrown in or out of mesh as desired. Under the usual practices of locomotive design, the boiler would not be adequate to supply steam to both the main and auxiliary cylinders through long periods at appreciable speeds. Therefore, the object of the booster is to provide greater tractive power in starting trains and it is for this reason that it has been found of considerable advantage on passenger locomotives.

HEARING ON "SUBORDINATE OFFICIALS"

Commissioners Clark, Daniels and McChord conducted a hearing at Washington on October 1 at which members of the various labor organizations and representatives of the railroads presented arguments for and against modifications of the regulations defining the term "subordinate official." This term is used in the Transportation Act to define those minor railway officers who come under the jurisdiction of the Railroad Labor Board. Some of the smaller organizations desire independent recognition of their members as subordinate officers so that they may represent them before the Railroad Labor Board, while the larger labor organizations desire to retain jurisdiction over as many men as possible and the railroads desire that those who are in a fiduciary relationship to the company or who have authority to employ, discipline, or dismiss employees shall be considered as officials. The Grand Order of Supervisors of Railroads maintains an organization somewhat different from the other labor organizations and takes the position that its members are officials. The commission's regulations issued on March 23 define subordinate officials in accordance with their relations with the company and include some who are claimed by the organizations. E. T. Whiter, representing W. W. Atterbury, chairman of the labor committee of the Association of Railway Executives, said that officers having authority to employ, discipline or dismiss employees should not be represented by organizations. If the management is to be permitted to conduct operations in an efficient manner, he said, it must be free to deal with its officers without any divided allegiance on their part. Chairman Clark announced that the commission is now making a reclassification of railroad employees for statistical purposes which should not be confused with any definition of subordinate officials which it may make as required by the law.

CONSTRUCTION NEWS

The Ann Arbor Railroad will receive a loan of $250,000 from the Interstate Commerce Commission to aid in making additions and betterments to roadway and structures at a cost estimated at $500,000, the railroad to finance $250,000 of the cost. The proposed additions and betterments include improvements of and additions to facilities at Toledo, Ohio, at a cost estimated at $400,000, which will enable the Pennsylvania to operate through the terminals of the Ann Arbor at that point to a connection with the Pere Marquette at Alexis, Ohio, making a through Detroit line.

The Arkansas & Louisiana Missouri has applied to the Interstate Commerce Commission for a certificate authorizing it to operate the line from Monroe, La., to and through Bastrop, La., to Huttig, Ark., and, when rehabilitated, the line from Bastrop to Crossett, Ark.; also, for authority to issue $1,000,000 of capital stock for the payment of the purchase price and the necessary cost of rehabilitating the property acquired from the Arkansas & Louisiana Midland at a foreclosure sale.

The Atchison, Topeka & Santa Fe has let contracts to Jerome A. Moss, general contractor, Chicago, for extensions and alterations to its passenger station at Ponca City, Okla., and for the building of locker room and lavatory facilities at its roundhouse at Chanute, Kan. The work at the first point is estimated to cost approximately $30,000 and will comprise waiting room, plumbing and heating facilities, while the second contract will total approximately $12,000.

The Santa Fe has let a contract to Joseph E. Nelson & Sons, Chicago, to construct a machine shop at Albuquerque, N. M., to cost approximately $1,250,000. This shop, which will be the central structure of a group of six other buildings to be constructed later, will have exterior walls of steel and glass construction, a composition roof and a mastic floor. There will be 26 engine pits. It is to be heated by a fan system placed in the upper structure. A total of 3,640 tons of steel will go into the building.

The Santa Fe also is accepting bids for the construction of two lavatory buildings, one a two-story structure and the other a one-story building, at Shopton, Iowa, to cost approximately $45,000.

The Atlantic Coast Line has resumed construction on its line from Goodno, Fla., to Immokalee, a distance of 26 miles.

The Canadian National contemplates improvements to its plant at Thaudiere Junction, Quebec, to cost approximately $200,000, which will include an extension to the enginehouse and the installation of a coaling plant.

The Chicago & Alton has awarded a contract to E. Page, Marshall, Mo., for the construction of a frame passenger and freight station at Grain Valley, Mo.

The Chicago & North Western has awarded a contract to G. A. Johnson & Son, Chicago, for the construction of a one-story brick passenger station at Glen Rock, Wyo.

The Chicago & North Western has awarded a contract to John Marsh, Chicago, for the construction of an extension to its Heineman branch line 2½ miles in length, tapping a lumber region near Antigo, Wis. The work will cost approximately $75,000.

The Chicago, Burlington & Quincy has awarded a contract to T. S. Leake & Co., Chicago, for the construction of a brick and stucco passenger and freight station, 24 ft. by 100 ft., at Albany, Mo.

The Chicago, Indianapolis and Louisville contemplates the construction of car repair shops at Lafayette, Ind. This company is also accepting bids for the construction of a car repair shop at Bloomington, Ind., to cost approximately $35,000.

The Chicago, Milwaukee & St. Paul is constructing three stations on its elevated Evanston line, to be used by the Northwestern Elevated Railroad, Chicago. The stations, which are at Howard avenue, Rogers Park and Loyola, are under the concrete bridges forming a part of the elevated road at these crossings. The stations will be of brick construction, costing $20,000 each, and will be completed about December 1.

The Chicago, Rock Island & Pacific contemplates the construction of a frame passenger and freight station at Maryland Heights, Mo. The company is also considering the erection of a car repair shed at Invergrove, Iowa, to cost approximately $25,000.

The Rock Island has awarded a contract to the Railway Water & Coal Handling Company, Chicago, for the construction of a water station and treating plant at Valley Junction, Iowa, to cost approximately $85,000. The Railway Water & Coal Handling Company will also install a fire protection system in the company's shops at Shawnee, Okla., at an approximate cost of $17,000.

This road has awarded a contract to the T. S. Leake Construction Company, Chicago, for the remodeling of its main freight house at Rock Island, Ill., to provide larger warehouse facilities.

The Rock Island has also awarded a contract for the construction of a freight house, 40 ft. by 260 ft., at Enid, Okla., to T. S. Leake & Co., Chicago. The office section of this building will be of brick construction, with a tile roof, and the freight sheds will be frame, with a covering of corrugated iron.

This company has also awarded a contract to Joseph E. Nelson & Sons for the building of a three-story office building at the corner of Sixty-third and La Salle streets, Chicago. This building, which will be 60 ft. by 84 ft., is to be of reinforced concrete construction, and will be completed about December 15.

The Chicago, St. Paul, Minneapolis & Omaha has let a contract to the Ogle Construction Company, Chicago, for the construction of a 150-ton frame coaling station at Clayton, Wis.

The Chicago Union Station has entered into an agreement with the Post Office department for the construction of a post office terminal in Chicago for handling parcel post and transient mail, which is to be utilized in conjunction with the Union Station project. The building will be constructed by the station company and will be leased to the government for a term of 20 years at an annual rental of $500,000 for the first five years, and $310,000 annually for the last 15 years.

This company also contemplates the construction of a viaduct on Madison street, Chicago, east, extending from Canal street to the bridge across the Chicago river, and it is understood that bids will be accepted shortly for the structural steel required for this work.

The Union Station Company has also let a contract to the Underground Construction Company, Chicago, for the building of the substructure on the south side of the new viaduct at Roosevelt Road, Chicago. The Underground Construction Company has also been awarded a contract for the installation of conduit lines between Harrison and Polk streets with the W. J. Newman Company, Chicago, and is now constructing the sub-sidewalk to be built in connection with the widening of Canal street, betwen Harrison and Van Buren streets.

The Cornwall Railroad has awarded a contract to the Austin Company, Cleveland, Ohio, for the construction of a machine and locomotive erecting shop at Lebanon, Pa. The new building will be of reinforced concrete, brick and steel construction. The dimensions will be 140 ft. by 180 ft. and 50 ft. high. The cost is estimated at approximately $160,000.

The Detroit, Toledo & Ironton is contemplating the construction of a timber treating plant in the vicinity of the 400,000-acre tract of timber land recently purchased by the Ford interests on the upper peninsula of Michigan. This road has also applied to the Interstate Commerce Commission for a certificate of necessity and convenience for a 15-mile extension, leaving its main line near Flat Rock, Mich., or Trenton, and extending to the Ford furnace plant on the River Rouge.

The Elgin, Joliet & Eastern is enlarging its power house at Gary, Ind., and is installing two additional boilers of 225 hp. each to serve the terminal of the road at Kirk Yard, Ind. The company is also replacing its turn-table at Gary with a new 100-ft., 350-ton turn-table operated by motor.

The Grand Trunk contemplates the construction of a frame engine house at Kalamazoo, Mich. The company has awarded a contract to the Roberts & Schaefer Company, Chicago, for the installation of electric elevating equipment in the coaling station at its Milwaukee Junction yards in Detroit, Mich.

The Grand Trunk will start work at once on the construction of a two-story building, for the use of the Canadian Express Company, at Stuart street, Hamilton, Ont. The building will be of brick construction on a concrete foundation and will cost about $25,000. The work will be carried out by company forces.

The Ft. Dodge, Des Moines & Southern has awarded contracts to W. J. Bitterell, Webster City, Iowa, and the American Bridge Company for work in connection with the rebuilding of the frame trestle approach to a bridge crossing the Des Moines river, near Ft. Dodge, Iowa.

The Great Northern has awarded contracts to the Bay City Foundry & Machine Company, Bay City, Mich., for the construction of nine locomotive coaling stations. The new stations will be located at Burlington, Seattle, Everett, Columbia River, Wilsoncreek, Harrington and Marcus, Wash., at Grand Forks, N. D., and Minneapolis, Minn.

The Great Northern has also awarded a contract to Peppard & Fulton for rebuilding the outer portion of iron ore dock No. 3 at Allouez Bay, Superior, Wis., and for the construction of an approach to dock No. 1, at an approximate cost of $1,500,000.

The Idaho Central has applied to the Interstate Commerce Commission for a certificate of convenience and necessity in connection with the proposed construction of a line from Rogerson, Idaho, to Wells, Nev. The company holds that the building of the proposed line will open up extensive agricultural and mining territory now without railroad transportation. Officers further maintain that a new road will shorten the distance between points in Idaho, eastern Washington and Oregon, on the one hand, and Nevada and California on the other, by approximately 400 miles.

The Illinois Central has started the construction of a third track from Peotone, Ill., to Tucker, a distance of 13 miles, which is estimated to cost approximately $475,000.

The Michigan Central is constructing a frame passenger station at Cheboygan, Mich., to replace the station destroyed by fire last year. The company is also installing a transfer table at its shop at Jackson Junction, Mich., at a cost of approximately $30,000, and is rebuilding a coaling station at Jackson Junction which was recently destroyed by fire.

The Midland Valley has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 100-ton frame coaling station at Pawhuska, Okla.

The Minneapolis & St. Louis contemplates the rebuilding of its terminal facilities, including its roundhouse, at Fort Dodge, Iowa.

The Minneapolis, St. Paul & Sault Ste. Marie has awarded a contract to the Consolidated Construction & Manufacturing Company, Withee, Wis., for the construction of a passenger and freight station at Phillips, Wis. The building will be a single story structure, 24 ft. by 150 ft., of reinforced concrete, brick and tile, and will cost approximately $35,000.

The Missouri, Kansas & Texas has entered into a contract with the Texas & Pacific for the joint use of the line between Whitesboro, Tex., and Fort Worth. Under the terms of the agreement the line is being relaid with new 85-lb. rail and all-wood trestles and steel spans are being repaired and strengthened.

This company has also awarded the contract for the erection of a $300,000 hospital building at Denison, Texas, by the Hospital Association of this road, to Munn & Co., Dallas, Texas. The building, which will be of brick and reinforced concrete, with slate roof, will provide a capacity of 100 beds. The architects are Roberts & Gresenbeck of Dallas, Texas.

The Missouri Pacific is rebuilding a section of its line extending from Poplar Bluff, Mo., east to Kinzar, a distance of about 2½ miles. This project involves raising the single track line between these two points on an average of 6 ft., and calls for the construction of 150 ft. of new pile trestle and the raising of 1,430 ft. of existing pile trestle to an average height of 6 ft. This company is also rebuilding its line from Fisk, Mo., west, to Ives, a distance of about 2¼ miles. The work calls for the construction of about 3,000 ft. of new pile trestle, and for raising the grade of the line on an average of 10 ft. for the entire distance. The existing draw span across the St. Francis river is being replaced by two 50-ft. deck plate girders and one 91-ft. 6-in. through plate girder. The List & Weatherly Construction Company, Kansas City, Mo., is building the new bridge, and company forces are handling the rest of the work. The total cost of the entire project will be $403,000.

This road has awarded a contract to J. E. Nelson & Sons, Chicago, for the construction of a reservoir, dam, pump house, and water lines, at Wagstaff, Kan., at an approximate cost of $90,000.

The New York Central has asked for bids for the construction of a subway under its tracks at Brown street, Rochester, N. Y., to cost approximately $500,000. The company has recently awarded a contract to the Peckham Construction Company, Buffalo, N. Y., for the railway's share in the construction of a viaduct over its tracks at Herkimer, N. Y., which will cost the company approximately $46,000.

The Ocean Shore has been authorized by the Railroad Commission of California to discontinue service permanently on its northern division, extending from San Francisco, Cal., to Tunitas, and to dismantle and dispose of this property. The application of the road for permission to discontinue service on its southern division will be taken up by the commission at a later hearing. The road is approximately 54 miles in length, and has been operated at a loss, continuously since 1912.

The Pacific Fruit Exchange Company has begun the construction of an ice house and storage warehouse at Ogden, Utah, to form part of the $1,000,000 improvement project contemplated by this company and the Union Depot Company of Ogden.

The Pacific Great Eastern has awarded a contract to the Northern Construction Company, Vancouver, B. C., for the construction of a line from Deep Creek, B. C., to Prince George, a distance of 136 miles. The project, which will cost $10,000,000, involves the construction of 36 timber trestles and one viaduct 600 ft. in length. The company has recently placed a line in operation from Squamish, B. C., to Deep Creek, a distance of 294 miles.

The Palatine, Lake Zurich & Wauconda has applied to the Interstate Commerce Commission for authority to cease operating and to abandon its line from Palatine to Wauconda, Ill., because it has been unsuccessful in efforts to obtain funds to provide needed facilities.

The Pennsylvania System has under construction an addition to one of its electrical substations at Philadelphia, Pa., in which new equipment to cost about $100,000 will be installed. The building will be 30 ft. by 30 ft. and 60 ft. high, of brick, terra cotta and reinforced concrete, and will cost approximately $60,000. The contract for the construction of the building has been let to F. A. Havins Company, Philadelphia, Pa.

This road will also construct a new overhead vehicular bridge over its tracks at Tonelle street, Jersey City, N. J., to replace the present structure. The engineering department is now working on plans. This bridge will have a total width of 50 ft. and will be 97 ft. long, allowing for the passage of eight tracks under it—two more than the present structure provides space for. The superstructure of the new bridge will be of steel, while the bridge itself will be of concrete construction with an asphalt wearing surface on the cover deck.

The Pennsylvania System, the Erie and the Baltimore & Ohio have entered into negotiations with the city of Akron, Ohio, for the separation of grades in Akron. The original

estimate made in 1916 called for an expenditure of $3,000,000, of which the city was to pay one-third and the railroads the remainder. Officers of the Pennsylvania, who are engaged in designing the proposed work, now contemplate an expenditure of approximately $5,000,000. Preliminary plans for the project have been agreed upon by the parties concerned, and surveys are now being made. It is expected that construction will be undertaken early in 1921.

The Pennsylvania Railroad has received the approval of the Interstate Commerce Commission for a loan of $6,780,000 from the revolving fund for additions and betterments. The company's application shows the following as the principal items of the proposed expenditure:

New pier grain elevator, Baltimore	$740,000
New additional engine house facilities at Wilmington	500,000
New first and fourth tracks, Maryland division	632,000
Grade revision Oakville to Shippensburg	123,600
Raising bridge at Pittsburgh	187,802
Engine house facilities at Canton	699,790
Yard facilities at Canton	108,784
Third and fourth tracks at Canton	128,000
Third and fourth tracks Maximo to Canton	238,337
Polk street and Taylor street viaduct, Chicago	150,000
One Hundred and Twelfth street, viaduct, Chicago	208,500
Fort Wayne shop improvements	350,000
Chicago Junction yard and engine house facilities	810,896
Wellsville shop improvements	122,112
Cleveland track elevation work	130,000
Grade revision Kenwood to Rochester	400,000

The Potato Creek Railroad has filed an application with the Interstate Commerce Commission for authority to abandon that portion of its line extending from Keating Summit to its connection with the Pennsylvania at Liberty, Pa., 2½ miles, and on completion of a branch from Keystone, 2 miles north to a junction with the Pennsylvania at Hamlin Siding, to abandon its line from Liberty to Norwich, 12 miles.

The Richmond, Fredericksburg & Potomac has awarded a contract for the construction of a freight warehouse at Richmond, Va., to the J. T. Wilson Company of Richmond. The new building will be 71 ft. by 253 ft. with a concrete foundation, brick walls and a steel truss roof and will cost approximately $100,000.

The St. Louis-San Francisco is constructing second track from Olathe, Kan., to Spring Hill, a distance of 7 miles. The company is also building a line from Eureka, Mo., to Pacific, 7 miles in length; a line from Lebanon, Mo., to Sleeper, 7 miles in length; and a section of road from Globe, Mo., to Monett, a distance of 4 miles. The Walsh Construction Company, Davenport, Ia., the List & Gifford Construction Company, Kansas City, Mo., and the Scott & White Company, St. Louis, Mo., are the respective contractors for these projects, which involve a total expenditure of $1,000,000.

The Frisco is accepting bids for the construction of a freight house at Ada, Okla., to cost approximately $50,000.

The St. Louis-San Francisco has awarded a contract to the William McDonald Construction Company, St. Louis, Mo., for the construction of a roundhouse and machine shop at Dublin, Tex. The Frisco has also awarded contracts to the Hedges-Weeks Construction Company, Springfield, Mo., for the setting of a new turntable, and the construction of cinder conveyors and materials racks at Dublin.

The Sante Fe-Northwestern contemplates the construction of a line from a connection with the Atchison, Topeka & Sante Fe at Bernalillo, N. M., northwest through Sandoval County to La Ventana, a distance of 55 miles.

The Southern Pacific, Texas and Louisiana Lines has authorized bridge work amounting to approximately $700,000; ballasting at various points, estimated to cost $3,800,000; and new rails to be laid which will involve an expenditure of $2,800,000.

The Tampa Southern has again taken up the construction of a 9-mile belt line from Gillette, Fla., to Palmetto, via Ellenton, which work was held up during the war period.

The Texas & Pacific contemplates the construction of yard tracks in the new industrial district north of Pacific avenue and Akard street, Dallas, Tex., at a cost of approximately $100,000. Upon the completion of this improvement and the removal of main tracks in Pacific avenue, the Texas & Pacific will be able to operate its trains around the south limits of Dallas, over a portion of a new belt line now being constructed by the Houston & Texas Central.

The Texas Central contemplates the rebuilding of its station at Albany, Tex., which was burned recently.

The Texas, Oklahoma & Eastern is constructing a line from Broken Bow, Okla., to De Queen, Ark., a distance of 25 miles, at a cost of approximately $600,000, which will permit the company to operate its line from Valliant, Okla., to Dierks, Ark., a distance of 76 miles, by January 15, 1921.

The Union Pacific has awarded a contract to O. P. Chedron, Salt Lake City, Utah, for the construction of a reservoir at Leroy, Wyo.

The Union Pacific is constructing 1½ miles of additional yard tracks in connection with the extension of its terminal facilities at Shoshone, Idaho.

The Western Pacific has awarded a contract to Twohey Brothers, San Francisco, Cal., for the construction of a line from Bidwell, 1½ miles, to Bidwell Bar, Cal. The building of the line will involve the excavation of 32,000 cu. yd. of solid rock.

IRON AND STEEL

The railways have ordered 440,000 tons of rails for delivery next year from the United States Steel Corporation. The production has been distributed as follows: 300,000 tons to mills in Chicago district; 80,000 tons to the Carnegie Steel Company, and 60,000 tons to the Tennessee Coal & Iron Company.

The Chicago & Alton has ordered 121 tons of steel from the American Bridge Company to complete two additional stories in its new north freight and office building at Chicago.

Chicago, Burlington & Quincy has ordered plate girder spans for use in the super-structure of the Rock river bridge at Rock Falls, Ill., to replace some Howe truss spans destroyed by fire some time ago.

The Chicago, Milwaukee & St. Paul has ordered 30,000 tons of rails from the United States Steel Corporation.

The Chicago & North Western has ordered 910 tons of steel from the American Bridge Company for ore dock work at Ashland, Wis.

The Chicago & North Western has ordered miscellaneous material amounting to 114 tons for an ore dock work at Ashland, Wis.

The Chicago, Rock Island & Pacific has ordered 40,000 tons of rails from the United States Steel Corporation.

The Detroit, Toledo & Ironton is laying new 85-lb. rail to replace all 60, 70 and 75-lb. rail on its system.

The Government of the Netherlands, Colonial Department, 17 Battery Place, New York, is inquiring for 20,000 tons of 82-lb. rails for use on the State Railways in Java.

Holst & Vadillo, 161 Maiden Lane, New York, have ordered 40 tons of railroad spikes from the Consolidated Steel Company for export to Cuba.

The Minneapolis & St. Louis has ordered 5,000 tons of rails from the United States Steel Corporation for 1921 delivery.

The St. Louis-Southwestern has ordered deck plate girder spans amounting to 264 tons from the American Bridge Company for work at Plano, Texas, and Addison.

Coal Output per Miner.—The average production for each underground worker employed in the coal mines of the United States during 1918 were 1,134 short tons, according to statistics published by the United States Bureau of Mines. The closest competitor as regards output per miner is New South Wales, where each underground worker in 1918 produced 814 tons. British Columbia ranked third, with 790 tons, and Nova Scotia was fourth, with 718 tons. The smallest individual output for recent years was that of Japan in 1917, when an average of 155 tons was mined by the underground employees.

SUPPLY TRADE NEWS

GENERAL

The American Steam Conveyor Corporation, Chicago, has changed its corporate name to the Conveyors Corporation of America. There is no change in either the personnel or policy of the company.

The T. J. Moss Tie Company, St. Louis, Mo., has purchased property at East St. Louis, Ill., and at Granville, Wis., 10 miles northwest of Milwaukee, as sites for new timber preserving plants to be devoted largely to the treating of railroad crossties. These two plants are to supplement a plant now operated by this company at Mt. Vernon, Ill.

The St. Louis Pump & Equipment Company, engineers and manufacturers, has been organized, with headquarters at St. Louis, Mo., to manufacture and install liquid handling equipment, specializing in units for gasoline and oil, measuring devices, etc., especially adapted to railroad and industrial use. The company has opened executive offices in the International Life building and temporary factory space has been secured in the western industrial section of St. Louis. **C. C. Fredericks,** of Fort Wayne, Ind., has been elected general manager, and **John C. Roberts, Jr.,** is president. Others affiliated with the company are: **Willard D. Smith, Sherwood Hines** and **J. S. Farrell.**

PERSONAL

Horace B. Hench, vice-president of **Templeton, Kenly & Co., Ltd.,** Chicago, has resigned.

Clarence C. Brinley has been appointed eastern manager of the trolley carrier department of the Conveyor Corporation of America, Chicago. Mr. Brinley's headquarters are at 110 West Fortieth street, New York City.

D. J. Crowley has been appointed Michigan sales agent of the Tacony Steel Company, Philadelphia, Pa. Mr. Crowley's office is in the Dime Bank building, Detroit, Mich. **D. B. Carson** has been appointed Cleveland district sales manager.

C. C. Fredericks, whose appointment as general manager of the St. Louis Pump & Equipment Company, St. Louis, Mo., is noted elsewhere on this page, was born on August 18, 1882, at Richmond, Va. Mr. Fredericks was educated at Valparaiso University, Valparaiso, Ind Practically his entire business experience has been with oil and liquid handling or pumping equipment. He entered the employ of S. F. Bowser & Co., Fort Wayne, Ind., in 1912 and served this company in various capacities from salesman to executive assistant. For the four years preceding April, 1920, he had charge of the railway business of S. F. Bowser & Co.

C. C. Fredericks

G. E. Anderson, formerly assistant eastern sales manager of the Duff Manufacturing Company, Pittsburgh, Pa., has been promoted to southwestern sales manager in charge of its new branch office in the Railway Exchange building, St. Louis, Mo.

R. E. Bressler, manager of the Jordan Company, East Chicago, Ind., has resigned to accept a position with the **Western Wheeled Scraper Company,** Aurora, Ill. Mr. Bressler is succeeded by **A. L. Greenabaum,** supervisor of work equipment and motor cars of the Chicago, Rock Island & Pacific at Chicago.

Charles H. McCormick has been appointed western representative of the railroad department of the Standard Paint Company, New York, with headquarters in the Plymouth building, Chicago. Mr. McCormick began railway work in the mechanical department of the Michigan Central at Bay City, Mich., and later was transferred to Jackson, Mich., and Detroit, at the latter place serving as chief clerk to the superintendent of motive power for six years. He later went with the Standard Heat & Ventilation Company, at New York and Chicago for four years and was with the Hegeman-Castle Corporation, at New York and Chicago for four years previous to entering the service of the Standard Paint Company.

TRADE PUBLICATIONS

Steel Lockers and Shelving.—The Van Dorn Iron Works Company, Cleveland, Ohio, has issued a pamphlet illustrating and describing the Van Dorn steel lockers and Van Dorn Simplex shelving.

Welding and Cutting Apparatus.—The Bastian-Blessing Company, Chicago, has issued a 36-page catalog, illustrating and listing its complete line of gas welding and cutting apparatus. This booklet not only describes and illustrates each piece of equipment, but also shows various complete sets of apparatus designed for different classes of service.

Structural Steel.—Harris Brothers Company, Chicago, has issued a 32-page catalog containing an announcement of the taking over of the business and operation of the Joliet Bridge & Iron Company, Joliet, Ill. The book contains a large number of illustrations of various classes of structures fabricated by that company together with tables and bills of material of various plain and fabricated materials carried in stock.

Grab Buckets.—The Blaw Knox Company, Pittsburgh, Pa., has recently issued two small folders, descriptive of its line of excavating and reclaiming buckets. One of these folders describes the Blaw bull dog bucket, which is designed for especially heavy service such as involves the handling of broken stone and hard ore. Photographs and illustrations show the use of this bucket and diagrams and tables give the properties and principal dimensions of the five sizes of this bucket. The smaller folder discusses the principles of lever arms as applied to the design of Blaw buckets.

September Earnings.—The railroads of the country will show net earnings for September, approximately $80,000,000, judging by figures on 160 out of 187 class I roads, compiled by the Bureau of Railway Economics. If the roads were to show an annual return of 6 per cent on their properties, as was intended by the Interstate Commerce Commission in approving increased freight and passenger rates, the earnings for September should total about $109,000,000.

Consolidation of National Forests.—Within the boundaries of the National Forests are 20,000,000 acres of privately owned timber lands. The total area within the National Forests is 155,000,000 acres, of which 135,000,000 acres belong to the government. The location of the private lands makes them frequently an obstacle to the efficient administration of the public forests. In many cases the private lands are widely scattered or are completely surrounded by government owned lands. This is often an economic disadvantage to the owners, especially to those who wish to operate. Also some of these tracts are cut over and might well be acquired by the government for reforestation, and made a part of the national forests. The Sinnott bill introduced during the last session of Congress in the House of Representatives, is an effort to solve the problems created by this intermingling of public and private forest lands. This bill, on which hearings were held by Congressional committees, provides for the consolidation of forest lands within the national forests by means of exchanges.